

MOTOR AGE

Volume XXXVII
Number 17

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CHICAGO, APRIL 22, 1920

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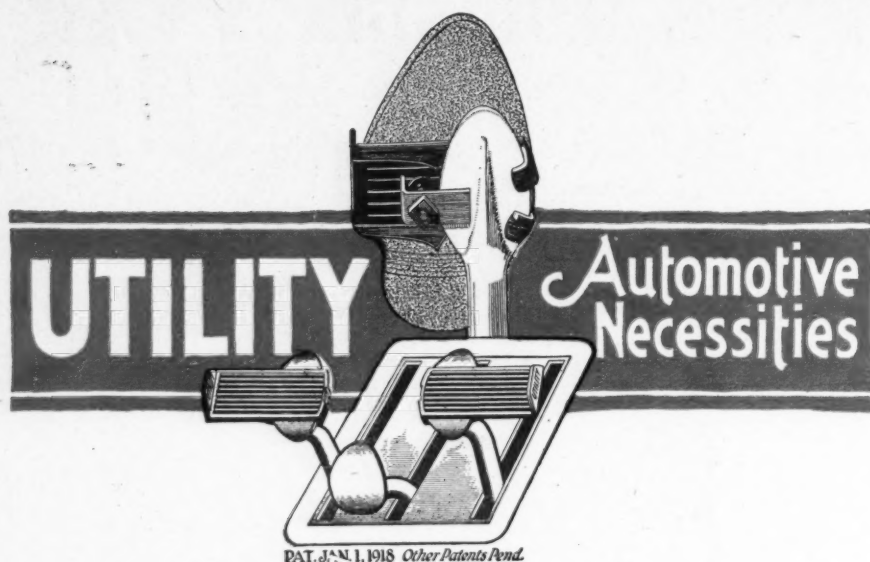
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(E-6)



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MOTOR AGE

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CONTENTS

Copyright 1920, The Class Journal Co.

The Pneumatic Truck Tire.....	7
Selling Preventive Service.....	11
He Combined His Garage and Home.....	14
Service Managers Who Made Good.....	15
Some Good Service Forms and How Used.....	16
Good Service To Sell.....	18
Combining Beauty With Utility in Service Buildings.....	20
Making the Tractor More Comfortable.....	21
Description of New Steinmetz Truck.....	34
Description of New National Sedan.....	35
Description of New Bosch Magneto.....	35

NEWS SECTION

Railroad Strike Hits Motor Car Production.....	23
Gets Data on Effect of Weather on Roads.....	25
Canadian Border Towns Plan 1000 New Homes.....	25
Brockman Elected to Head St. Louis Dealers.....	26
New Insurance Risk Rates Announced.....	26
Blame Bad Roads on Trucks.....	27
Cincinnati Plans Municipal Garage.....	27
Kansas City's Unite to Promote Roads.....	28
Indiana Roads a Mere Political Issue.....	28
Kentucky Truck Dealers Start Annual Tour.....	29
Montreal Dealers Hold Convention.....	29
Charlottetown Show Marks Canadian Progress.....	30
Say Trucks Ruin Connecticut Roads.....	30
St. Louis Tire Dealers Improve Conditions.....	31
Three Societies Combat Fuel Problem.....	31
Ship French Racers to Indianapolis.....	32
Cincinnati Speedway Under Hammer.....	33

DEPARTMENTS

Servicing the Overland Four.....	36
Standard Tractor Operations.....	38
Garage Planning.....	40
Law in Your Business.....	42
Readers' Clearing House.....	43
Where to Obtain Parts for Orphan Passenger Cars and Trucks.....	55
The Accessory Corner.....	56
Service Equipment.....	57
Automotive Repair Shop.....	58
Motor Age Weekly Wiring Chart.....	59
Farm Lighting Tables.....	60
From the Four Winds.....	62

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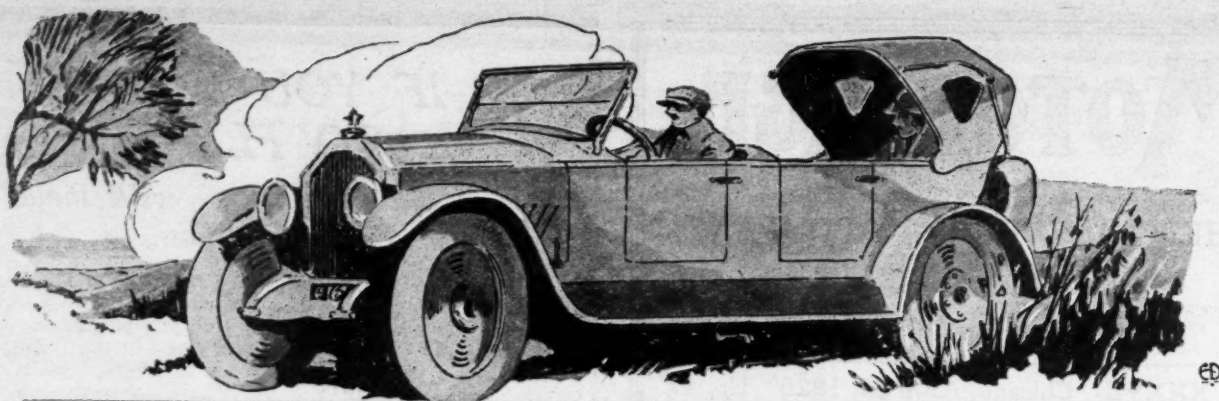
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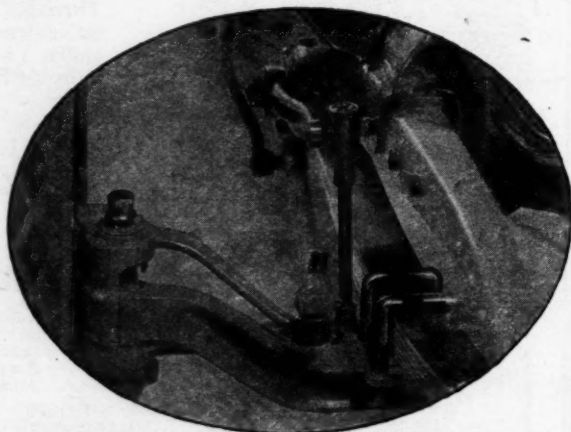


Photo showing part of Panhard-Levassor chassis — Houdaille standard equipped.

The Cunningham has adopted Houdaille as standard equipment. And the famous foreign motor cars—Alba, Alda (F. Charron), DeLaunay, Belleville, Farnam, Panhard & Levassor, Minerva, Piccard & Pictet, Peugeot, Renault, Rochet-Schneider, Secqueville and Hoyau, Unic (Q. Richard) are also equipped with Houdaille.

There must be a reason—let us tell you about it.

Certain desirable territory still open to the right dealers



Houde Engineering Corp. 1396 West Ave., Buffalo, N. Y.

MOTOR AGE

THE PNEUMATIC TRUCK TIRE and

The Dawn of a New Era in Transportation

by
**David
Beecroft**

FITTING of pneumatic tires on motor trucks with capacity up to $3\frac{1}{2}$ tons useful load is one of the greatest movements taking place in the motor truck industry at present. The magnitude of this fitting of pneumatic tires instead of solids, is appreciated when the extension of the usefulness of the motor truck by virtue of the pneumatic tire is analyzed. The pneumatic tire makes the truck a practical vehicle for almost every phase of farm work. It can carry its rated load in sizes of 1 ton, $1\frac{1}{2}$ ton, 2 ton on soft ground, making it possible for the farmer to load the product on the truck in the field and deliver it direct to market if the product admits of such handling.

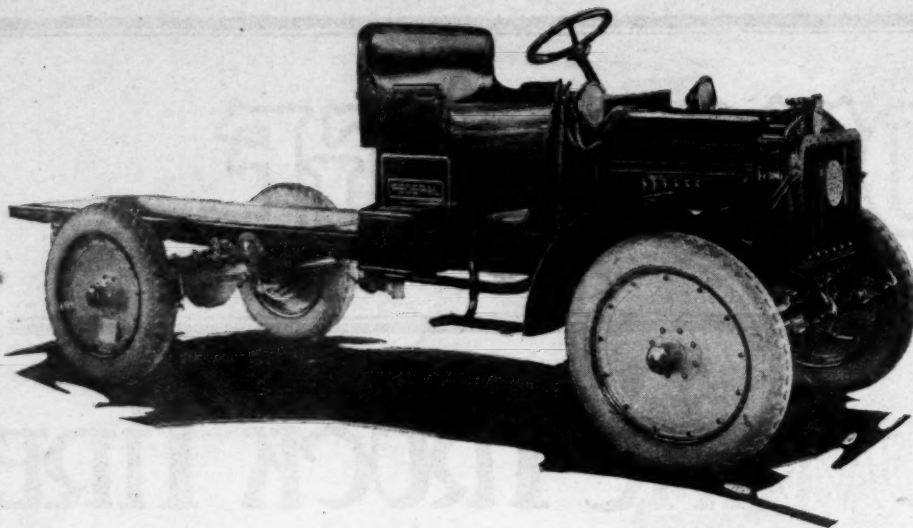
The extended use on the farm is but one phase of the extension of truck use. For intercity hauling, for motor bus routes, and for practically every kind of truck work there are increases in the field of work and reductions in the cost of maintenance.

Today the motor truck industry is but approaching the threshold of the great number of changes that must take place before 100 per cent efficiency in pneumatic tires can be reached. In spite of this movement being but in its swaddling garments the possibilities following the use of pneu-

TO SAY that the pneumatic truck tire introduces a new starting point in the truck transportation field is not an exaggeration. The giant pneumatic has made foothills of mountains in the intercity truck transportation problems. David Beecroft, a national character in the automotive world, and Directing Editor of the Class Journal Co., has conducted an extensive investigation on the giant pneumatic tire, and the results of his remarkable investigation are told in this story and the forthcoming issues of Motor Age

matics are being fairly well appreciated by manufacturers and users.

The growth of the pneumatic tire on trucks has been away in advance of the expectations of the most optimistic. Some of the leading tire manufacturers, building giant pneumatics for trucks, have not been able to keep abreast with demand. Although the advent of the movement started but a few years ago, approximately 135,000 motor trucks fitted with pneumatics will be delivered by manufacturers this year. This out of a total expected production of 325,000 trucks for this year is indicative, not only of the demand, but of the appre-



The new 1-ton Federal truck designed and built exclusively for pneumatic tires

ciation of this demand by the truck maker. Approximately 50 per cent of all motor trucks built in 1921 will be fitted with pneumatic tires as factory equipment.

These figures do not represent the complete progress made by the pneumatic tire for trucks as some of the larger tire makers are doing a great deal of conversion work, that is, taking trucks at present in use and changing them from solid tire equipment to pneumatic equipment. One tire concern has 600 conversion jobs per month.

Beyond Experimental Stage

While the movement is new and has come almost as an avalanche, the pneumatic tire for motor truck is practically beyond the experimental stage. The conception of using a pneumatic tire on a truck of 2 or 3 ton capacity dates to 1908 or perhaps earlier. Those were of conventional fabric construction and did not give the desired results. It given the pneumatic tire for trucks by virtue of the cord construction. In that year some leading tire concerns began actively pushing its cord construction development work and the success of the Giant pneumatic to-day is due entirely to the cord construction. Those tire makers behind the movement do not believe that the Giant truck pneumatic would be possible to-day without the cord construction.

In all fairness it must be said that the tire makers were the leaders in the development of the pneumatic idea for trucks. Not only did it originate with them, but has been strenuously propagated by them. In this work Goodyear, U. S. and Firestone must be given pioneer credit. Goodyear has waged an aggressive campaign with truck manufacturers and a score of other classes of manufacturers who are influenced by the transition from solids to pneumatics. Goodyear's confidence in the future of the pneumatic lead to its organization of a comprehensive national system of testing pneumatics and demonstrating them to vindicate their reliability.

To do this Goodyear established its overland hauling route from Akron to

Boston and return, using pneumatic tired trucks. On this service to date motor trucks have traveled in all 1,200,000 miles. The tires used have been such sizes as 38x7; 40x8; 42x9; 44x10 and 48x12. Trucks of varying capacities up to 3½ tons useful load have been on this work. In all of this work not an accident has happened. There has been no injury to any drivers or passengers. There has been no damage to freight.

It is due to this and similar demonstrations that the manufacturers have recognized the possibility of the pneumatic tired truck. It is demonstrations of this character that have carried the tire out of the experimental field and made it a reality. In a word, the pneumatic tired truck is not something that is coming. It is to-day a reality.

There are hosts of reasons why the pneumatic tired truck has come and why hundreds of existing truck owners are converting solid tired trucks to pneumatic tired ones. The following are a few of the reasons why this change has come about:

Reduced Vibration

In an area of well paved streets, such as Greater New York, it might be imagined that a truck with solid tires would be more serviceable and reliable than one with pneumatics and that on good pavements there would not be excessive vibration from the solid tire equipment. One of the best known transportation authorities in New York, who has hundreds of motor vehicles under his control and who has investigated the matter scientifically, declares that a truck fitted with pneumatic tires as compared with solids has a reduction of 15-20 per cent in vibration. When this is true on good pavements the added advantage on poor highways can be appreciated.

Up to the present the distribution of motor trucks with pneumatic tires has not been confined to any one area of the country. It is not such population centers as New York, Chicago or Twin Cities, where the pneumatic tired truck has gone. Rather its distribution has been very general over the entire coun-

try. It is conservative to state that more trucks have been sold with pneumatic equipment in small towns in ratio to business of such places than in large cities. The farmer has been a strong buyer. Large sales have been made to those engaged in intercity or intertown haulage. The motor bus has practically 85 per cent of all its equipment in the country on pneumatics, but it is impossible to definitely refer to any particular area or any special field that could be looked upon as exclusive for the pneumatic tire. The distribution has been general and national.

The increased speed of a motor truck on pneumatics is the most fascinating phase of this new movement. This added speed brings forward one of the most serious problems in connection with it. When a truck speed is jumped from 14 miles per hour to a possible 20 or 24, many things happen. Generally the engines will not stand up for this higher speed. Their lubricating system may not prove adequate. Their bearings may not be sufficient. There is literally a dozen respects in which the engine designed to operate at 1000 r.p.m. or 1200 r.p.m. for solid tires cannot withstand the harder service of 1600 r.p.m. or perhaps more that might be needed on pneumatics. In actual practice some engines where the speed has been very high have been broken down in 500



Giant Goodyear Cord Tire, 48 by 12 in., used on 5-ton Master truck

miles. This is no reflection on the engine but the natural outcome of endeavoring to operate it at much higher crankshaft speed than it was designed for.

This higher pneumatic tire speed is too frequently misunderstood. Too many imagine that the great advantage of the pneumatic tire comes from an average of 20 m.p.h. or perhaps higher. In general service the greater mileage of the pneumatic tired truck is due to bringing up the low average. A solid tired truck will have to slow down to 4 m.p.h. on rough going, whereas the same truck with pneumatics might pass over such a road at 12 or perhaps 15 m.p.h. It is by increasing the average of the slow speeds that the pneumatic tired job

makes its showing rather than by jumping the top speed from 14 to 20 or 22 m.p.h. Because of this the extra strain on the engine is not so severe as might be imagined. Bringing up the low average speeds as indicated does not carry the engine speed unduly beyond that of solids.

One truck maker who has fitted many pneumatics on his truck which was designed for solids has been able to increase his crankshaft r.p.m. 10 per cent without injuring the engine and with this extra speed the truck has been quite successful. Trucks so altered in crankshaft speed have been in service with pneumatic tires for a year without giving any indications of premature engine destruction.

Increased Traction

The increased traction of the pneumatic tire on trucks is one of the great advantages of it. During the snow of the past winter the pneumatic tired trucks on the 40-mile route between Akron and Cleveland were able to continue service during the big snows after the solid tired trucks were compelled to abandon the work. What is true with the increased traction in snow is similarly true in soft ground where the pneumatic has demonstrated itself in the past year.

This latter fact carries the appeal of the pneumatic tired truck to the farmer and as we see it to-day, seems to have done much to solve the truck problem on the farm.

Approximately 75 per cent of the 700,000 motor trucks in the country operate in the snow belt. These trucks might be kept operating all winter and the past snow storm has developed how much superior the truck with pneumatics is to that of solids.

The possibilities of reducing the time of receiving freight in intercity haulage by motor trucks with pneumatic tires as compared with railroad and express systems has been well demonstrated by Goodyear in its Wing Foot motor truck



Pneumatic tires on an Oldsmobile truck operating under the auspices of the New York State Department of Farms and Markets and Division of Foods, carrying farm produce from Buffalo to Syracuse. The higher speeds made possible by the pneumatic tire assures the farmer of getting his produce to town in the shortest time possible

service between Akron and Cleveland. Some time ago, owing to it requiring 6 to 7 days for freight to reach Akron from Cleveland, a distance of 40 miles, this service was established and Goodyear freight from areas around the Great Lakes was consigned to Cleveland rather than Akron. At Cleveland receiving and shipping warehouses have been established and the complete transportation of freight between Cleveland and Akron is by the Wing Foot service.

With this service freight is delivered from Cleveland to Akron in a matter of four hours, each truck making two round trips or averaging 160 miles per day. During 1919, 18 trucks were in this service and there was a fleet mileage of 164,000 miles and an average speed of 14.6 m.p.h. The advantage in time by the motor truck over the railroad and express was:

Freight by railroad, 6 to 7 days.
Interurban packet service, 2 days.
Express service, 3 days.
Motor truck service, 4 hours.

But the economy of time was only one of the demonstrated value of the pneumatic tired truck. The reduction in rate on a year's service showed that Goodyear transported freight at 35 cents per hundred lb. by motor truck as compared with 85 cents per hundred lb. first class railroad freight and 67 cents per hundred lb. express. The railroad rate required very frequently crating and handling of the merchandise at each end. What has been done on the Akron-Cleveland route with the pneumatic tired truck can be done in practically any other part of the country if the problem is attacked in a business-like manner.

Some Figures on Economy

While specific figures on economy in gasoline and oil are available very frequently such figures have to be broadly explained in order that the economies indicated are understood. Such explanations are not possible in a dissertation such as this, and no attempt will be made to explain figures showing economy. It is sufficient to say that the manufacturers of pneumatic tires for trucks are very active in inducing truck owners to keep accurate cost records because by such records the real economy of the pneumatic tire is learned.

Some figures from tire companies are quoted here for the purpose of rounding out the picture of the pneumatic tire. Two trucks of 2-ton capacity, one operating on solid tires and the other on pneumatics, in a mileage of 3850 each, the cost for gasoline on the solid tire job was \$230, and on the pneumatic tire job \$156. The records show the pneumatic job traveled 30 miles more than the other.



A 3-ton Packard equipped with giant Firestone pneumatics. This truck was used in the run from San Francisco to Los Angeles and return in the first California highway motor train

THE Giant Pneumatic Tire and its importance in the future development of trucks is told in this story and in the stories to come. One of the characters in the Automotive Industry, David Beecroft is telling these stories. You as a dealer should read them. They will help you to solve your future problems in the truck business when the giant pneumatic becomes more common than it is now.

Other stories to come will take up the subjects of

The Effect of the Giant Pneumatic on Truck Service;

The Giant Pneumatic and Its Necessary Service Equipment;

Actual Service Operations on the Giant Pneumatic. (Illustrated.)

Oil records show that the truck with pneumatic tires average 619 miles to the gallon, whereas that of solids average 252. It would be unfair to suppose that both engines were identical, so that the complete economy cannot be ascribed to the pneumatic tire.

In another comparison of two trucks 2-ton capacity each, one with solids and the other pneumatics, the cost per mile was 35 cents on pneumatics and 55 cents on solids. This was based on 1000 miles of use and includes all costs, such as depreciation, overhead, etc.

Reduced Maintenance Expense

The purpose of these figures is to indicate that fuel and oil economies exist.

The greatest economy, at least it is considered so, is that which comes from reduced vibration which is equivalent to reduced maintenance of the truck. Where vibration is reduced from 15 per cent to perhaps 40 or 50 per cent in many cases, the reduced upkeep of parts can best be appreciated by those who have had experience with maintenance handling. There are many fleet owners who are desirous of changing from solids to pneumatics without any thought of increasing the miles per hour, but solely to reduce overhauling costs and to get better traction in snow and on soft ground.

Pneumatic tires on trucks cost considerably more as original equipment than solids. Generally speaking, the increase approximates closely to \$200 per ton capacity for pneumatics over solids.

On a one-ton truck the cost will be \$225 to \$275 greater than with solids.

On a two-ton truck the cost will be \$200 to \$400 more.

On a three-ton truck the cost will be \$600 to \$700 more.

With this higher original cost it becomes necessary for the truck owner to keep accurate records of his oper-

ating cost in order to have a full appreciation of pneumatic tire economy.

Much has been said concerning the danger of trucks fitted with pneumatic tires upsetting when they are punctured or blowout due to the supposedly long drop due to the large size of the tire. So far as we have been able to learn this upsetting matter is purely imaginary and has not taken place in practice. Goodyear has an accurate record of trucks traveling 1,654,393 miles during the calendar year of 1919 without a single accident due to a truck upsetting or running off the road, although there were numerous cases of blowouts or punctures which afforded an opportunity for such an accident. The facts are that there is practically no possibility of a truck upsetting or getting out of control when a Giant pneumatic explodes. This is primarily because when a 44x10 in. tire explodes that end of the axle does not drop 10 in. as you might expect. The drop is only 3 3/4 in., due to the thickness of the tread and walls of the tire. A 10 in. tire has 16 layers of

The following tabulation, giving the number of layers of cord in Goodyear tires of different size, as well as giving the thickness of the tread strip, and lastly, the total thickness of the tire, carries fiction as to why puncturing is little known in the pneumatic truck tire and why the wheel drop is slight in the case of a blowout; these figures apply to Goodyear tires:

Tire Size	Layers of Cord	Tread Thickness	Tot. Tire Thickness
36x6	10	1 1/8 in.	1 3/8 in.
38x7	10	3/4 in.	1 3/8 in.
40x8	12	7/8 in.	1 7/8 in.
42x9	14	1 1/8 in.	2 1/8 in.
44x10	16	1 1/4 in.	2 1/2 in.

These measurements were taken at the middle of the tire and if taken at the shoulder, the total thickness will be 1/4 in. additional.

cord material, to which must be added a very thick rubber tread strip. It is this great thickness which totals 2 1/2 in. that makes the drop relatively small, and makes such a thing as upsetting out of the question.

Take the case of a 40x8 in Giant pneumatic which promises to be one of the popular sizes, the drop in case of a blow-out would be 3 1/2 in. With the smaller sizes the drop is less.

The question of possible mileage with pneumatic tires is one depending very greatly on the nature of service as well as the conditions under which the truck operates. Tire manufacturers are using every effort to see that trucks are not under tired as were passenger cars ten years ago.

Giant 48x12 Not Likely

The Giant 48x12 pneumatic, which is the largest that has been used, is not in commercial production at any tire factory, and so does not enter into any of the tabulations herewith. This size is largely experimental and there is some doubt as to whether it will become a commercial size or not.

The sizes of pneumatic tires for trucks of different capacity are indicated in the following tabulation, which gives sizes for front and rear wheels separately:

Truck Capacity, Tons	FRONT WHEELS		REAR WHEELS	
	Tire Size	Max. Wt. Per Wheel	Tire Size	Max. Wt. Per Wheel
1 1/4	4 1/2 x 5	800 lb.	34 x 5	1600 lb.
1 1/2	4 1/2 x 5	1000 "	36 x 6	2100 "
2	4 1/2 x 4	1200 "	38 x 7	3000 "
2 1/2	34 x 5	1500 "	40 x 8	3500 "
3	36 x 6	1800 "	40 x 8	4000 "
3 1/2	36 x 6	2000 "	44 x 10	5200 "
4	36 x 6	2100 "	44 x 10	5700 "

The different permissible weight carried on tires of the same size on the rear wheels calls for a different inflation pressure, the heavier the load the greater the pressure.

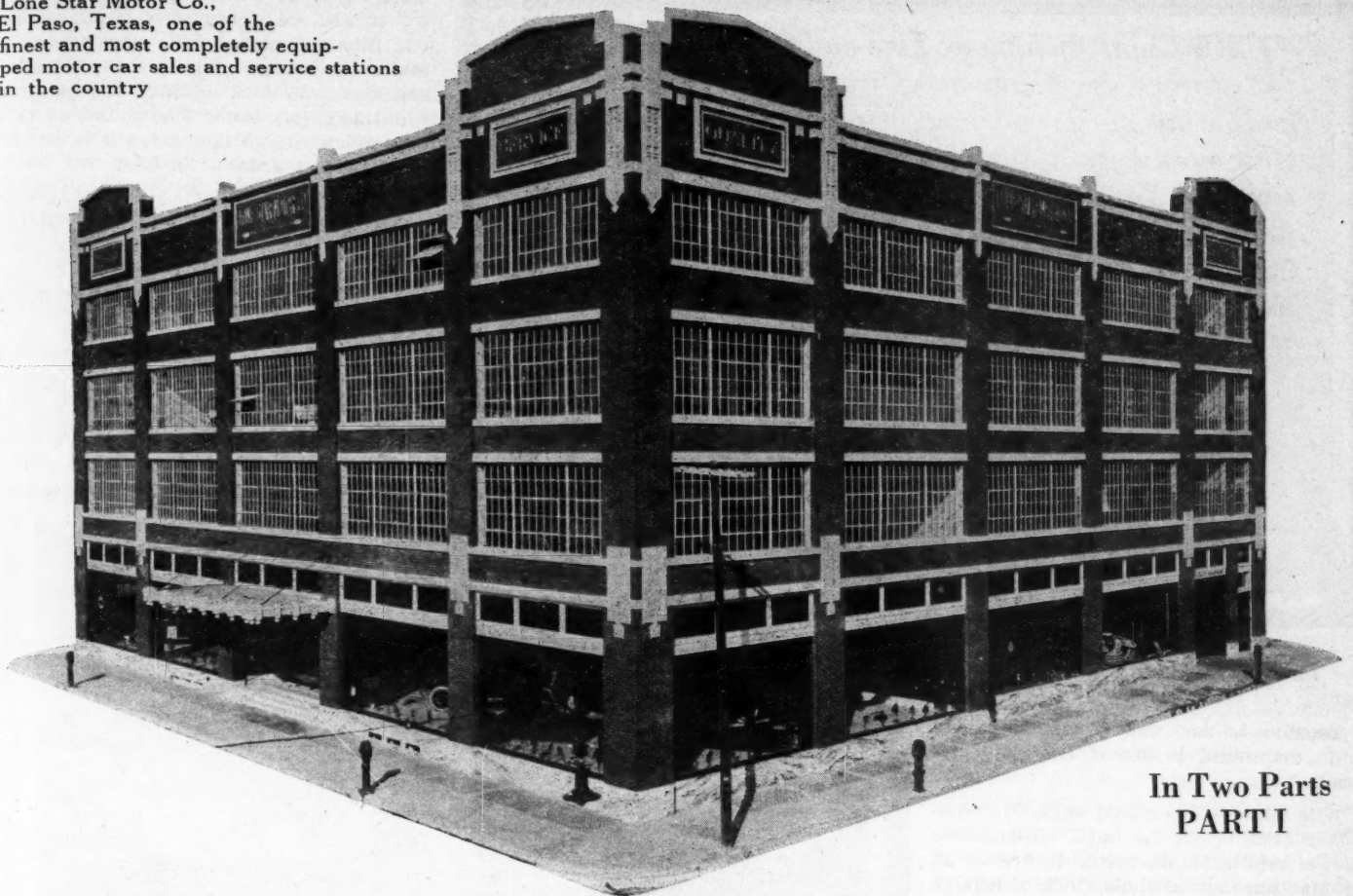
The speed with which the pneumatic for trucks has been taken up by car manufacturers is best indicated by figures relating to the recent motor truck shows. At the Chicago Motor Truck Show, held in January, 1919, only 12 motor trucks were exhibited with pneumatic tires. At the New York Motor Truck Show, held in January, 1920, 45

(Concluded on page 30)

The tire makers have pretty generally agreed on what is the maximum load permitted on a given size tire and what is the pressure inflation that should be used. It is not possible to give figures that will apply to all makes of tires, but the following approximates what will doubtless be general conditions:

Tire Sizes	Inflation Pressure	Maximum Weight Per Wheel
34x5	80 lb.	1700 lb.
34x5	80 lb.	1700 lb.
36x6	90 lb.	2200 lb.
38x7	100 lb.	3000 lb.
40x8	110 lb.	4000 lb.
42x9	120 lb.	5000 lb.
44x10	130 lb.	6000 lb.

Lone Star Motor Co.,
El Paso, Texas, one of the
finest and most completely equip-
ped motor car sales and service stations
in the country



In Two Parts
PART I

SELLING PREVENTIVE SERVICE

Inspection and Free Lubrication During the Life of a Car Relied
Upon to Anticipate Trouble By the Lone Star Motor Co.

WE ARE just beginning to do business with a customer when he buys a car," says E. Gordon Perry, president of the Lone Star Motor Co. of El Paso, Texas.

The business of the Lone Star Motor Co. is the apotheosis of service. Nothing is sold but service. This idea dominates every activity of the company, and to its application every factor contributes, building, equipment, men and methods.

The building of the company a four story and basement structure, 120 ft. square, built of steel, concrete and glass, is simply an embodiment of the idea of service, and is one of the most perfect establishments of its kind to be found anywhere in the country.

Ample Service Facilities

Indeed, it looks out of place in El Paso. To all appearances it is out of all proportion to any demands which seem likely to be made upon it for a long time to come. In a sense this is true. Although the company has between 5000 and 6000 cars in the possession of customers in and around El Paso, and although they expect to give continuous service on these and all subsequent cars sold, so ample are the facilities for service afforded by the Lone

Star building and equipment, that they hardly are crowded at any time.

The truth is that Perry built for the future and for the demands of an international trade. His territory includes large areas in Old Mexico, lying immediately south of El Paso, and his hope was that relations with Mexico would have been so straightened out by this time that

PREVENTIVE SERVICE

The Lone Star Motor Co., El Paso, Texas, believes that prevention is always more satisfactory than the cure. They insist that the customer bring his car in for free inspection and lubrication after it has run 500 miles. There is no charge for any part of this service except the oils greases used.

Following the first inspection the owner is expected to bring his car in after every 1000 miles and the lubrication and inspection procedure is repeated.

The second part of this article will be told next week. This will include views of the repair shop and a plan showing layout of departments and benches.

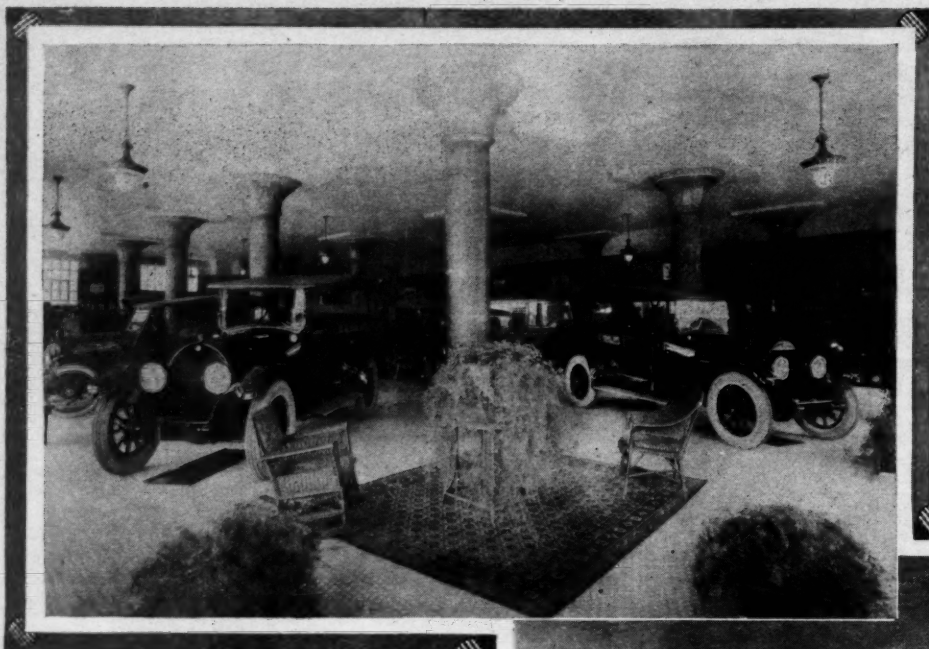
some of the trade possibilities in that territory might be realized upon. There is a profound conviction along the southern border that better conditions are imminent, and that a development of the Mexican trade will be possible in the near future. When this comes the Lone Star is ready for it. In the meantime the company is giving the acme of service to its customers on the American side, and lends its roof as a vantage point from which the citizens of El Paso may watch the progress of the battles across the border whenever Villa or any other bandit takes it into his head to capture Juarez.

"Satisfactory performance, upkeep expense and a determined service policy on the dealer's part, makes satisfied, happy car owners and a good, quick re-sale value for the cars sold by him."

Wholly a Service Station

That's Perry's creed and that's what the Lone Star equipment is designed to do. And for that reason Perry calls his entire establishment "service station," and not a sales room, nor a garage, nor any other term sometimes used to designate such an institution.

The idea behind the service given by



sales room. It all is back where the car owner will see it whenever he drives his car into the place. This department is under the charge of a specially detailed salesman who does nothing but look after retail accessory sales. The picture of this department shows how large it is and in what perfect order it is kept.

After a car is inspected by service manager Klohs, it is sent immediately either to the quick repair department across the elevator or is carried by the latter to the fourth floor, which is given up entirely to repair work.

The plan of the fourth floor gives the relative position of the various departments. As the building is composed principally of glass there is an abundance of

the company is that it shall be anticipatory and preventive.

Trouble is met more than half way and vanquished before it can raise its head.

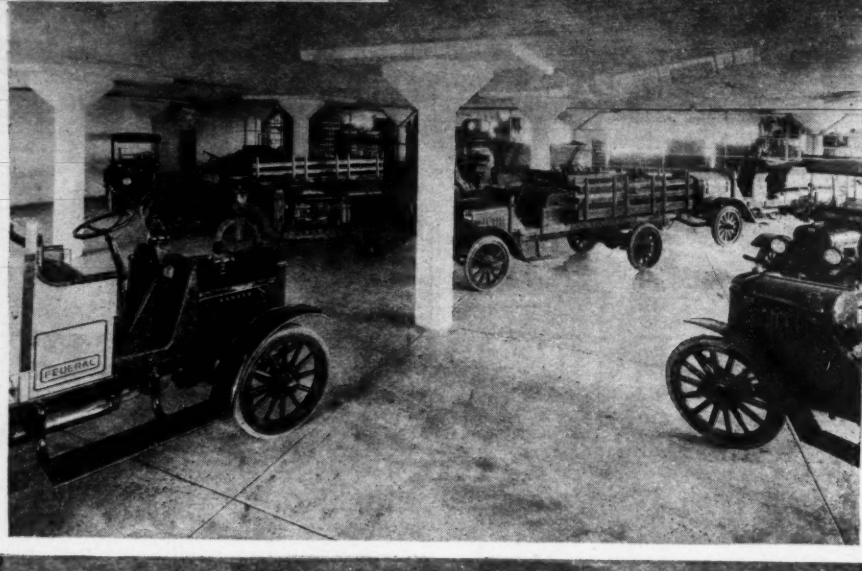
This idea is impressed upon the customer even before he buys. "Remember that a reputation is better insurance of satisfaction than a whole stock of legally phrased guarantees," says Perry. "In selecting the car to purchase, consider the factory behind the product, one with an honest purpose and a reputation for delivering value received. Consider the local firm representing the car its reputation and its ability for seeing that customers are taken care of as they should be, and in a way to which they are entitled. Ask to be shown the parts stock and the service department. Ask to talk to the service manager. See that all claims can be proved."

Service Own Cars Only

To make good on this sort of advice the company starts off with a popular line of automotive goods and the building and equipment to care for it. Hudson, Dodge, Stutz and Cadillac cars are sold with the G. M. C. and F. W. D. trucks. Service is confined to these lines. As the company has upward of 5000 customers already in the vicinity of El Paso, this matter of service is no small problem.

The display and sales room occupies nearly one-half of the first floor of the four-story building, with the offices and their appurtenances separating the sales room from the quick repair and retail accessory departments at the rear.

The show room, which is one of the handsomest anywhere in the country, has a tassellated floor, hanging chandeliers and is decorated in a soft shade of tan. El Paso is at times hot and sunshiny beyond the point of comfort, yet as soon as one enters the Lone Star sales room one is impressed by the subdued light and the cool restfulness of the place. Rugs,



The company sells the GMC trucks and enjoys a big trade. The tractor in the mid-distance is the tail end of a department which is being abandoned

Upper Left—One of the largest and most attractive sales rooms in the West or Southwest. Offices in the rear

chairs and plants contribute to the comfort and beauty of the surroundings and the room itself is so spacious that almost any number of cars can be displayed without the appearance of overcrowding.

The arrangement of the first floor rear is suggestive of the way the idea of service is sold. Notice the location of the service manager's desk. This is in charge of F. F. Klohs, and not a car can be driven into the building without its coming under his inspection and without its owner meeting him personally.

Quick repair to tires and other parts is rendered on the first floor. The car drives from the street directly across the elevator into the quick repair department where are men and facilities for doing whatsoever may be required.

The location and extent of the accessory display also are suggestive. None of this sort of thing appears in the car

light. Individual benches are stationed along the sides of the shop, one being assigned to each mechanic and every man is expected to own his own kit of tools. Special tools and equipment, however, are issued from the tool room in connection with the machine shop whenever required. Evidently every essential repair operation can be performed in this shop. At the present time between 35 and 40 mechanics are employed.

Used Car Sales on Second Floor

Floors two and three practically comprise a department by themselves. This is the used car department. The second floor is devoted to the sale of used cars, while the third floor is that upon which the used cars are made ready for display on the floor below.

It is the policy of the company to trade in only the cars which it sells, and to guarantee to the owner full trade-in

value. Cars taken in in this way go first to the shop on the top floor where they are given a thorough overhauling and are put into first class condition. Repairing to upholstering, tops and paint are made on the third floor, and by the time the used car reaches the sales and display room on the second floor it is ready to go out the second time with exactly the same guarantee on it which the company put on it when it was first sold. The company does not plan to make its used car department pay more than a merely nominal profit—all it asks is that this department shall break even.

The stock of spares and accessories occupies quite one-third of the floor space of the third floor and normally it will inventory in excess of \$80,000. This stock is in charge of a man whose duty it is to keep accurate account of every incoming and outgoing piece and to see that none ever falls below a certain minimum which is regarded as the low margin of safety.

Lone Star service is based entirely upon the idea of rendering service unnecessary. The company believes that this saves expense and trouble both to its customers and to itself, and considers this to be the highest form which service can take. To insure this reliance is placed upon frequent inspection and the plan pursued is that of offering free lubrication and inspection to car owners.

Free Inspection and Lubrication

The company insists that its customer bring his car in for inspection and lubrication for the first time after he has driven it a maximum of 500 miles. The car is met at the door by F. H. Klohs, and is immediately turned over to an expert mechanic for inspection and lubrication. The general lubrication order form used indicates what the mechanic must do. No charge is made for anything connected with this job except for the oils and greases used. As the work of lubri-

NEW CAR INSPECTION

Examine Front & Rear Wheels. _____
 Adjust Wheel Bearings & Grease same. _____
 Trim Front Wheels. _____
 Test Foot & Emergency Brakes. _____
 Grease Universal Joints. _____
 Grease Differential. _____
 Grease Transmission. _____
 Oil in Clutch if necessary. _____
 Grease Steering Gear. _____
 Grease Water Pump Cups. _____
 Grease Fan. _____
 Fill all Grease & Oil Cups. _____
 Examine Oil in Crankcase. _____
 Examine Battery Connections. _____
 Fill Battery with distilled water. _____
 Fill Radiator. _____
 Examine Ignition Points. _____
 See charging rate of Generator. _____
 Test Horn. _____
 Test Lights. _____
 Test Starter. _____
 Inflate Tires. _____
 Wash. _____
 Remarks: _____

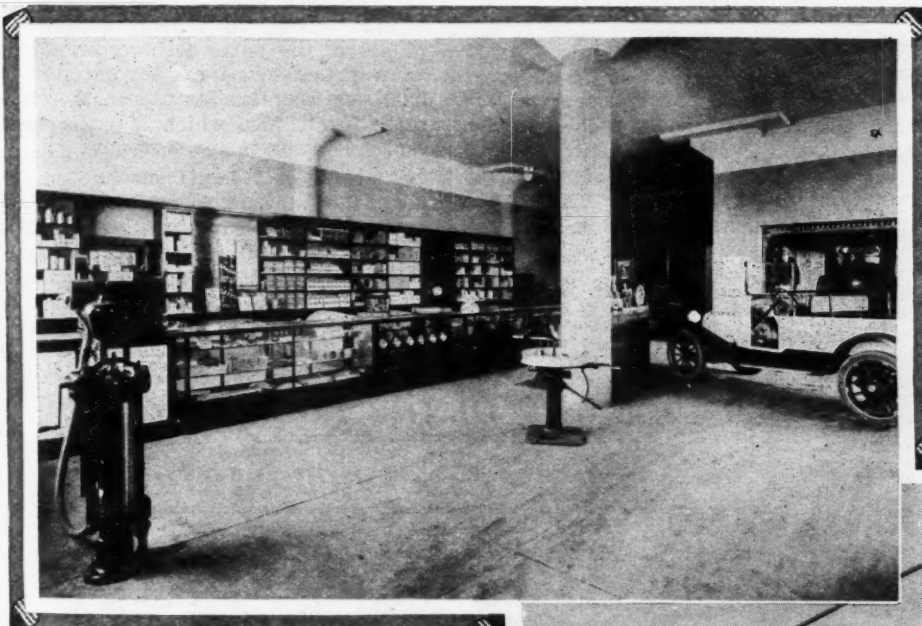
Inspector _____
 Official Practice No. 10, 1918

Before a car is delivered to the customer the Lone Star Motor Co. makes sure that everything is there and in good condition

cation subjects every part of the car to expert inspection it is easy for the mechanics to make such recommendations for repair work as the lubrication order allows for.

The matter is then up to the owner. If he is wise he permits the car to be taken to the shop and he allows the repairs to be made.

To be concluded next week



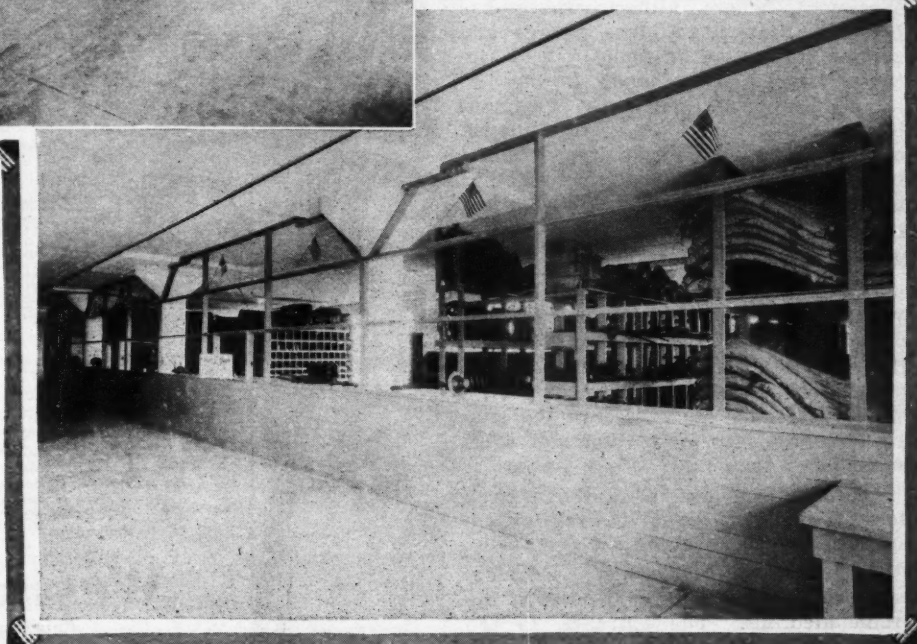
To insure this a complete card index system of the stock is kept, entries being made every day. It is part of the service plan of the company never to be out of any essential part or accessory when it is called for.

Basement Used for Storage

The basement of the building is of solid concrete and is as dry as a bone. Here are the necessary offices of the building, with a room for the storage of surplus tires and supplies and for surplus stock of all kinds.

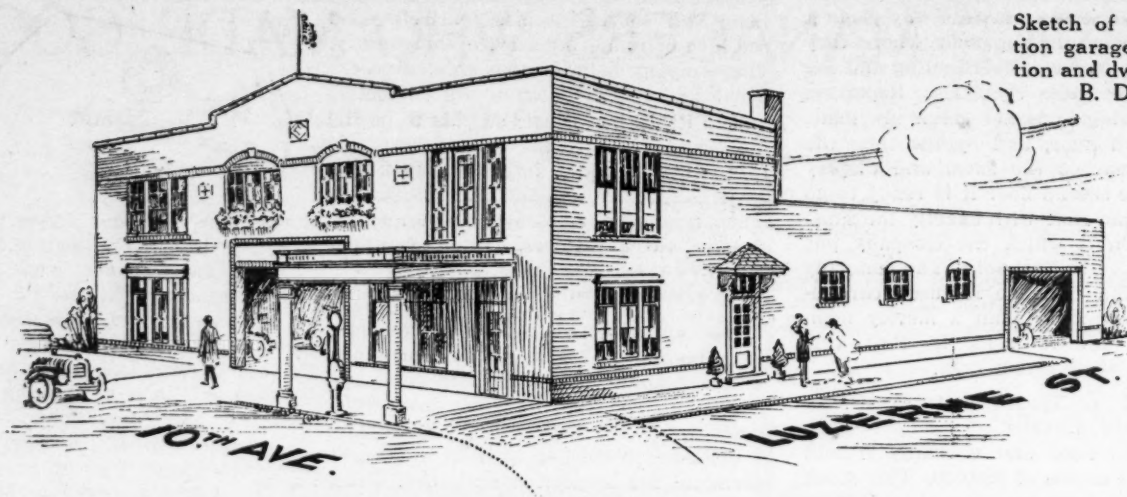
Taking it by and large, the Lone Star building is one of the most perfectly designed and equipped establishments for the conduct of the automotive business to be found anywhere in the country.

So much for the equipment for service. Now, as to the matter of rendering it. As stated at the outset, the scheme of



A stock of parts and accessories amounting to more than \$80,000 is carried at all times. A perpetual card inventory is kept and no part is permitted to fall below a minimum requirement

Upper Left—The retail accessory department. Special attention is paid to attractive display and orderly arrangement



Sketch of the combination garage, service station and dwelling of Roy B. Detwiler

He Combined His Home with His Business

Roy B. Detwiler put up a building on a spot where heretofore garage service was lacking

SOMETHING new, for Pennsylvania, has been done by Roy B. Detwiler, in the way of constructing and opening a brick, steel and concrete two-story building that is a combined garage, service station, sales agency for motor cars, and dwelling for himself, at Tenth avenue and Luzerne street, Johnstown, Pa.

Detwiler has obtained the agency for two standard makes of cars—the Crawford and the Malbohm light six and not only has arranged to provide complete service for these types, but also for any type of automobile and motor truck.

Detwiler's combination building is in the district of Johnstown known as Westmont, where hitherto there has been no first class large garage and service station, so he found a field virtually virgin and has made the most of it. As the name might imply, Westmont is a hilltop and there are a large number of car owners in the vicinity, including residents of Southmont, and other motorists constantly are coming through the borough, needing service.

Space for Storage

The building, just opened, is called the Westmont Garage. It is equipped not only to give service and supplies in the part apportioned to the garage proper, but also to provide storage. The entire first floor is devoted to the garage business, service station and sales agency.

There is 6000 sq. ft. in the garage, 4000 of which is used for the service end and 600 for the machine shop.

About 1200 sq. ft. is devoted to salesroom space, this being to the left of the front entrance. The entrance to the garage on Luzerne street, at the side of the building, is through double doors at the extreme end of the structure. The salesroom and office have a single door and there are large double doors for the garage entrance in front, on Tenth avenue.

Where Tenth avenue and Luzerne street meet, there is a driveway leading beneath a roomy porte cochere which roofs over the salesroom entrance and two office windows, and is supported by stout pillars at the curb. This is the only garage or service station in Johnstown—and there are few in Pennsylvania—where a customer may drive

under a roof, still be out of doors where there are no disagreeable fumes, and have the car supplied with gas, oil, or air.

The place is equipped throughout with air lines, the lines for the building and outside coming up halfway between the pillars of the porte cochere, or portico.

An instantaneous gas hot water heater has been installed for use on the wash-rack, for winter, which is being found especially convenient just now.

There is a 550-gal. gasoline pit beneath the sidewalk, in front of the building and provision for two tanks and two pumps. Fuel oil is kept in stationary, self-measuring tanks.

Opening of the New Garage & Service Station



WESTMONT, Southmont and other autoists who have occasion to come through these boroughs can no longer complain that they were unable to get Garage Service on the hilltop. This fine, new, up-to-date brick, steel and concrete garage, located at Tenth avenue and Luzerne street, has been erected to give the best possible service—not only to the passing autoist, but also to those desiring storage or portorage. Here you can get everything expected from a first-class institution and in keeping with the demands sure to be made in this particular district. We invite you to test our service.

Westmont Garage

Courteous and Efficient Service

Tenth Avenue and Luzerne Street.

Phone 37-71R.

We Are Exclusive Agents for the Crawford and the Malbohm Light Six Cars.

This is a copy of the advertisement which the Westmont Garage used to tell of its new home with an invitation to test its service

SERVICE MANAGERS WHO MADE GOOD

Being the First of a Series of Articles Telling Why Some Men Are Holding Their Present Jobs

ELEVEN years ago while a traveling service representative for a Detroit automobile factory, J. L. Burkhard so completely and satisfactorily adjusted the troubles of D. A. Harrington of Worcester, Mass., that he was offered a berth with the Harrington interests. He accepted. To-day Mr. Burkhard is service manager of the Harrington Hudson Co., Hartford, Conn., one of the largest and most successful establishments in the east.

As service manager of the Harrington Hudson Co., Burkhard had assuredly made good. Some idea of his responsibility is had from the fact that the Harrington Hudson Co. controls a big slice of the Connecticut territory.

A few years ago when D. A. Harrington decided to come down to Hartford to handle the Hudson he installed Mr. Burkhard as service manager. Burkhard didn't require a great deal of assistance at that time. But the sales department in true Harrington fashion put many a Hudson across. The business expanded, so did the demand for service. Burkhard kept pace with both. To-day there are two dozen men in the Harrington Hudson service department.

J. L. Burkhard received a grammar school education. He learned the machinist's trade and like many other young men of his time went into the automobile field. His finally became the task of traveling up and down the country imparting that sort of service that can be given by only the factory trained man. His work quite naturally brought him in contact with all classes of folks. Burkhard by reason of this experience is able to see a proposition from more than one angle. He has an agreeable personality. He inspires confidence and the fact that Hudson and Essex owners in this territory rely upon him fully is very gratifying to him, proof in fact that his efforts are not in vain.

The Harrington Hudson service manager says that a service is what one makes it and the making is obviously pretty much up to the service manager. His position entails considerable in the way of obligations and it is up to him to make good. Mr. Burkhard does not say that he has made good but D. A. Harrington says that he has and he knows.

The service manager said he had one big idea in mind when D. A. Harrington

There always is one or more good reasons why a man makes good on a job, and there always is a good story back of the success of a service manager in the automotive industry. Motor Age believes many of its readers who are service managers would like to know why other men in their line made good



J. L. Burkhard, service manager of the Harrington-Hudson Co., Hartford, Conn.

Burkhard made good on the job because—

He had one big idea in mind when he came to Hartford and that was to show the people around there what Harrington service meant.

He satisfactorily adjusted the troubles of D. A. Harrington when he was a traveling representative of a Detroit automobile factory.

He is able by virtue of his experience to look at a proposition from more than one angle.

He attributes his service success to good mechanics, labor-saving equipment, and close personal touch with the owner.

asked him to come down to Hartford and that was to show the folks in the Nutmeg capital just what Harrington service meant. And he did show them. In carrying out this laudable aim necessarily he had to select good co-workers. In this he was successful for he seems to have a knack of picking good men. And this force has gone on from one season to another. It does change from pillar to post. The same is true of the entire organization for that matter. Hudson service in Hartford to-day isn't taking a back seat for anything. And this is due to Burkhard.

There are times when the service manager looks more like a business man than he does a service manager. That is when he is dressed in street attire. One would never suspect that he had ever set foot inside a service station. Neatness is one of his strong points. He has handed it right down the line of his working force. Then there are times when the service manager will be found flat on his back under a car putting through a repair that is too much for the other fellows. Necessarily he has to meet a nice class of clients and wants to meet them on their own terms which means a neat attire.

Another ambition of Burkhard's was to have a large showing of satisfied service patrons. This meant deviating from the beaten path. It has all worked out very nicely.

Burkhard was asked to what he attributed the success of Hudson service and he said, "the best mechanics, time and labor saving tools and equipment, close personal touch of the owners with the men and

confidence of their ability and that desire on the part of the workers to see Hudson and Essex go over the top flying. It's just a case of team work."

MOTOR AGE is publishing herewith the first of a series of articles telling the inside story of these men. If you as a dealer think your service manager is making good for you, we suggest that you send us his picture and tell the story about him. One man's ideas will help the other and collectively they will help towards the betterment of service.

We learn from experience and by knowing what was the foundation for the success of another we may mold our future plans for better service.

Some Good Service Forms and Method of Using

Customer <u>Hunt Construction Co.</u>				Date <u>3-6-19</u>			
Address <u>Princeton, Illinois.</u>				Price Quoted <u>List</u>			
Class of Business		No. of Trucks Operated <u>1</u>		Buyer <u>L.M. Hunt</u>		Type <u>Pressed-on</u>	
Credit Limit \$ <u>COD</u>		Phone No. <u>602-W</u>		Salesman <u>Britt</u>			
Quan.	Ten Cap.	Name of Trucks	Daily Mil.	Size and Make Front Tires	Size and Make Rear Tires	Type	
1	32	Republic	50	36x5 Firestone	36x10 Firestone		
(1)							
Calls <u>4-17-19</u> . In market for new tires (front) <u>July</u> .							
<u>Aug 3-19</u> Pressed on <u>2-36x5 Firestone Tires</u> .							
<u>Rear Tires--good condition.</u>							

2

VULCANIZING DEPT.
CONDE'S TIRE SHOP
OTTAWA, ILL.

Name Dr. E. C. Parr 2-6-1920

Address Ottawa, Ill.

Make & Size 34x4 Dea. and

Tread & Bead S.S. Squeezee

Serial No. 4153160

How Repair Retread

Promised Mon-2-16-

Cost \$19.00

Order No. 6030

I.T. Co.

How the Conde Motor Supply Co. Systematized Their Service

THE Conde Motor Supply Co., Ottawa, Ill., have what they call a Gas and Oil Service Station, selling gasoline at one cent above cost, and oil for twenty cents a quart; and while this is running on rather a small margin of profit, still, oil, greases and soaps, which come under this department shows a profit. However, this department is also a drawing card to get the people to stop, and they do not use a cheap boy to pump the gasoline and oil, but try to keep a high priced salesman at the job and the other articles he will sell to gasoline customers will more than pay his wages.

The tires and tubes department includes solid, cushion and pneumatic tires. An average stock of about \$35,000 worth of solid tires, and about \$10,000 worth of pneumatic tires and inner tubes is carried. They figure on turning this stock four times a year on an average, some sizes much oftener, and other sizes not as often.

Getting the Tire Business

Another good scheme they have is to go out and call on all the truck owners using solid tires once or twice a year, and the tire salesman also keeps a close watch on this, and as soon as the tires get badly worn they take the owner's order for new tires for delivery in thirty, sixty or ninety days. A card file as per the card (No. 1) helps to keep up stock within a reasonable amount.

The accessories department stock always inventory over \$3000. This includes everything from valve cores on up and is one of the most profitable departments and has a turnover of a lit-

Mr. Jno. Doe, Salesman
Marseilles, Illinois. Route 45. 8-10-19
2 miles east -1 south of Clarey school house.
Parrett Tractor. (3)

Notify this prospect at time of our demonstration.
Send literature at once.

(Literature mailed 8-11-19.)

Conde Motor Supply Co.

No. 38

Owner's Name John Doe
Address 1450 Ill. Ave. Ottawa
Driver's Name Same
Address Chandler
Car Name Chandler
Engine No. 14342
Date in 2-5-20 Out 2-6-20
License No. 14276

Conde Motor Supply Co.
OTTAWA, ILLINOIS

No. 38

Received Car in satisfactory condition

Gasoline 5 Gals. 1.25

Oil 1 Qts. 20

Tires Tube 50

Vulcanizing 1 50

Tire Changes 1 75

Storage 1 50

Washing 1 75

Labor hrs. min.

Total 3.20

Conde Motor Supply Co.
PHONE 600
Complete Stock of Tires & Supplies
VULCANIZING A SPECIALTY
Cars Washed and Greased
All Property at owner's risk
No Car Delivered Without This Check

4

tle more than four times a year, and is a department which is necessary to give considerable time and attention to. Mr. Conde said he found it harder to buy for this department than any other, as it is very easy to buy a lot of chestnuts, or, in other words, articles that do not move readily. He does not carry any novelties or fads in this department, but a very complete line of spark plugs, spot lights, lamps, bulbs, pneumatic and solid tire chains, flash-lights and batteries, and many other numerous articles.

Next is the vulcanizing department, where all kinds of vulcanizing is done, from inner-tubes to the largest blowout in a casing, cord tires included, and re-tread work. If this department is turned over to one man to run and he is given absolute charge of that department, with an extra man as assistant, it will be found to be very profitable.

REPAIR TIME CARD		ON		OFF	Hours	PRICE
For	John Doe	8-4m to 11-42			3 3/4	3 75
On		5 pass Buick				
LABOR ON		Grinding Valves & timing				
		Drain Oil & Re-vise plugs & anything needed				
Material Used		5				
		1 Spark Plug				1 00
		Waste				10
		2 Valves				1 00
		1 1/2 gal oil				90
		Wipe				3 00
Workman		Harold Johnson				
		Total Charges,				11 75
Phone 600						
		CONDE MOTOR SUPPLY CO.				

CONDE'S TIRE SHOP	
Make	Firestone
Size	30 X 3 1/2
Bead	R.C.
Tread	Non-skid
Serial	164590
Sold To	C.M. Allen
Address	Mascoutch, Ill.
Rec'd	6-7-19 Cost 4.00
Make	Firestone
Size	30 X 3 1/2
Bead	R.C.
Tread	Non-skid
Serial	164590

Repair Parts Dept.	
Price	3 35
Model	6-39
Year	1919 & 20
Part Number	13742
Part Name	Conn. Rod
Date Rec'd	10-8-19
CONDE MOTOR SUPPLY	
OTTAWA, ILLINOIS	
227-20	

The card used in this department is marked No. 2.

There is machinery installed in this department for stripping the fabric off old tires, and while considerable of this old fabric is used in the vulcanizing department, some of it is also sold to other vulcanizing shops. Some of this fabric is used for reliners, the smaller pieces are used for boots and patches and inside boots for vulcanizing. One machine which cuts the bead off the old tires, another machine that strips off the fabric, and another which skives off the edge, bringing it down to a feather edge.

Keeps the Men Busy

This part of the work is not pushed, but at any time any of the boys run out of a job, instead of loafing for half an hour or so, they are put at this work. It is not very profitable, but however, it does show a profit and then it stops up the leaks which the idle time would otherwise make.

Storage department rates are 75c a night, or for a number of nights the rate is 50c a night, and rate by the month is \$10.

Cleveland and Chandler cars are handled. The Parrett tractor is distributed over a territory a little larger than La Salle county, having sub-dealers around who take care of this. Republic trucks is really the largest deal having over six counties, and have dealers who order these trucks in carload lots.

While the distribution of trucks and tractors is rather new, and this is the first year, total sales for January wholesale and retail total nearly \$30,000 for Republic trucks, Conde is looking forward to business this year in trucks, both retail and wholesale, of about \$150,000 worth. A card file keeps track of all prospects for cars, trucks and tractors and salesmen make out a report showing who was called on during the day, the bookkeeper then takes these

Concluded on page 41

FORM 88		CAR RECORD CARD		8		C	
Sold To		Mr. C.M. Morgan,		Make		Chandler	
Address		227 W. Jackson St., Ottawa, Illinois.		Car No.		2330	
Date Sold		1-15-1919		Motor No.		1654	
Our Invoice No.		6110		Model		19	
Color		Chan blue		Color		Chan blue	
Date Received		1-10-19		Checked by		Freight	
FACTORY INVOICE		Date		Number		Insurance No.	
COST RECORD		SALE RECORD		DETAILS OF CONTRACT		Days	
Cost of Car	15 79	30	Sale Amount	1975	00	Sale Amount	2095 00
Freight	33	20	Freight War tax & handling	120	00	Cash Payment \$	2095.00
Demurrage						Value of Car traded in	\$
Unloading	7	50				Balance Due	
Gasoline & Oil	1	75				Payable \$	per Month
Insurance	1	25	Total Sale	2095	00	with interest @	%
Commission	75	00	Total Cost	1698	00	Make of Car Traded in	
			Net Profit	397	00	Car No.	Year
			% Profit			Model	
Total Cost	1698	00					
Remarks							

GOOD SERVICE TO SELL

The Service Ideal of G. L. Murden & Son Is That Every Ford Owner in Their County Should Be Given Service by Them

SELLING service is fundamentally the same as selling motor cars or farm tractors, according to Jesse L. Murden, of G. L. Murden & Son, Ford and Fordson agent at Peru, Ind.

The fundamentals of all salesmanship are the same. So to get their service sold to the Ford owners, they went out with the same methods of selling the motor cars and the tractors, with newspaper advertising, with direct letters, with signs and with personal calls, for every Ford or Fordson salesman is also a service salesman.

The sale of Fords and Fordsons and the service which goes with these products go hand in hand. Each is a part of the other. Certainly, the well-sold service, and that, of course, assumes the well-done service certainly is one of the greatest aids in selling new products.

The man was right who said the satisfied customer was the best advertisement. You can't "wish" them satisfaction; you have got to give it to them, and sometimes with not a little trouble and expense to yourself. But it is all part of the big idea of service—something which you should do and which your customers have the right to expect.

And with them rightly satisfied, even if in some cases the satisfying has been costly, and even unwarranted, note the benefits of it. It all comes back, like the biblical bread cast upon the waters.

Service the Big Idea

What a big asset it is to your business to have all owners getting your service—and they have made it perfect in detail and intend to keep it so—to be talking about the service and the fair treatment they get.

It helps make sales of new goods. Indeed, good service is the best salesman for new goods.

The service ideal of Mr. Murden when he built his service department, was that every Ford or Fordson owner in Miami county, if at all possible, should be given service by the Murden company.

He had that ideal, because he wanted the business, but also because he wanted to be able to give that service better than any other man in his territory, to give it not only better but cheaper and quicker with the latest and best mechanical equipment, and that he wanted his institution to be in direct contact with every Ford and Fordson owner. Mr. Murden believes in advertising his service. He believes in his service. Service is intertwined with every other department of his business. The eight salesmen that are in the territory all the time selling Fords and Fordsons, are always selling Murden service, as a necessary thing in

the greater performance of the Ford products.

Murden uses the newspapers, not only in Peru, but in every other city in the county to sell his ideal of perfect service. He believes in newspaper advertising, for service and other things and says he has faith in it, because he has seen it bring results. This copy devoted to selling service is furnished by the Ford Motor Co., reinforced by some with the purely local touch, which he writes himself. Murden says he knows little about writing advertisements, but he does know something, he believes, about what his neighbors need and how they think. And knowing all these things his advertise-

ments have pulled—and the advertisement which pulls is a good advertisement.

Mr. Murden believes in the mails as a selling agent on service. He believes in it on selling other things, but says the mails should be used rightly, that the recipient won't be stimulated by anything but a good letter. Mr. Murden does not believe in the sloppy letter, or the multi-formed letter. All letters are specially typed for the customer and signed.

When a motor car agent uses the mails for sales, said Murden, his selling must be high class and right, for it must "get across" or it is too expensive. The advertising which "gets across" is the only

WEDNESDAY, FEBRUARY 27, 1920
SEVEN

WE WANT YOU TO KNOW MORE

about our Service Station for Ford cars and Fordson tractors. When you bring your Ford products to our Service Station you get more than a common repair job, you get real Ford Service from mechanics who study the needs of Ford products.

We have machinery to properly line up all parts that need expert attention; we also have a burning-in and running-in machine that puts your motor in proper condition when we overhaul your car.

This has been a hard winter on all cars and you will save money by letting us keep your car in running condition all the time. Your car will give you better service if you have it properly cared for in our Service Station. We use only genuine Ford parts and install them in a proper manner. We have the service you have a right to expect from an Authorized Ford Service Station.

COME IN AND LET US INSPECT YOUR FORD CAR FREE OF CHARGE

Very truly yours,

G. L. MURDEN & SON

FORD AND FORDSON TRACTOR DEALERS

PHONE 70
PERU, INDIANA

Typical display copy used by G. L. Murden & Son, Ford and Fordson dealer at Peru, Ind., to sell his service to the owners of Miami County. Mr. Murden believes in newspaper advertising, as well as other forms, to get the business in his territory

kind which pays—all other kinds are too expensive.

There is one element which Mr. Murden has worked into his business, that of community spirit, or "mixing," which is part of his salesmanship. Murden, they will tell you in Peru is one of the city's leading citizens, and belongs to all the clubs, lodges, organizations—not for what he can get out of them, but for what he can give to the community through his membership.

It is perhaps commercially selfish to say that this association is advertising, said Murden, but such associations are necessary if the business man knows the community and gives that community the service that he should give.

"The basis of selling service, like selling anything else," said Mr. Murden, "is having good service to sell. We are selling our service intensively now because we have organized our service so that we

call it perfect. We have two parts departments—one in the salesroom of our retail store and executive offices, and one in the service station, several blocks away. The one in the service station is for the benefit only of that shop. The one in the retail store is for owners and other service stations."

Keep Owners Satisfied

S. H. Murphy, who has been with Murden and other Ford dealers for years, is the director of service, but as a director, spends most of his time in the territory seeing that Ford and Fordson owners are satisfied and that the products sold are operating satisfactorily.

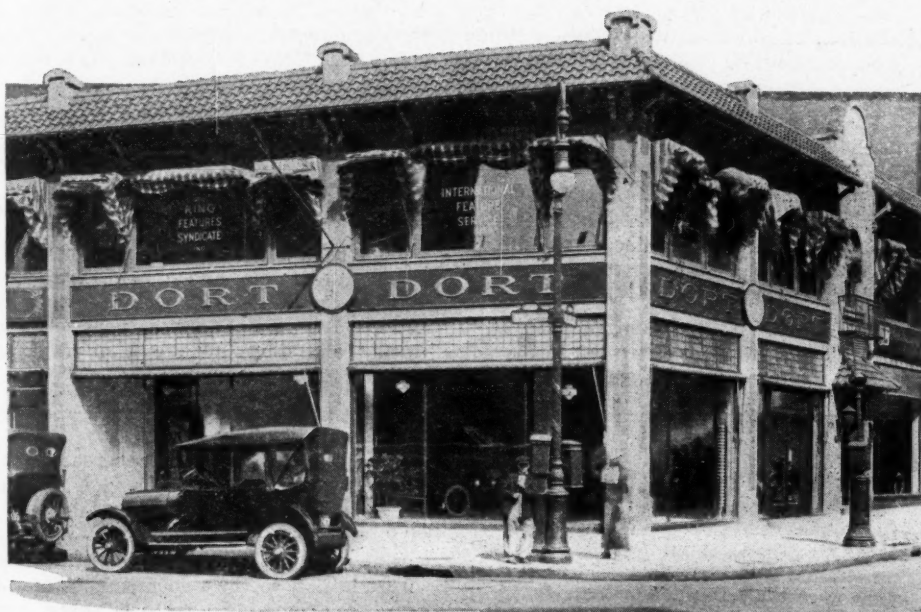
The service station of Murden is equipped with the latest machinery to do the best work, including an overhead track, burning-in stands, presses, radiator outfit, rear axle stand and all those mechanical assistants recommended by the Ford Motor Co. for doing good work

"We have parts all the time," said Murden. "No car or tractor goes down in our territory because we lack parts to keep it running. The right organization of our parts is necessary if the owners are to be satisfied and if service salesmanship is to be a great part of the business.

"How contented can we make 'em?—that's the idea which determines our service.

"We strive to give our patrons what they want when they want it. We co-operate with all repair shops, not protecting our own to the detriment of other shops handling Ford repairs. We believe we are in the best position to give the best Ford service—better than anybody else handling it, but when some one else is doing the work and if we, as the Ford agents, can be of assistance, we are going to be of assistance to the height of our ability."

Increasing Exports Force Dort to Establish New York Factory Branch



The new show room is in the heart of motor row. The Dort color scheme of blue and grey has been carried out fully in the showroom. This is supplemented by a generous sprinkling of taupe rugs on a field of mosaic flagged floor with a background of palms and ferns. The service and storage department is at 54th and 11th avenue. This is housed in a concrete and brick structure with 10,000 ft. of floor space and has a storage capacity of approximately 200 cars.

Dort sales in the New York territory have reached a volume never before known in that section. This is particularly true of New York City.

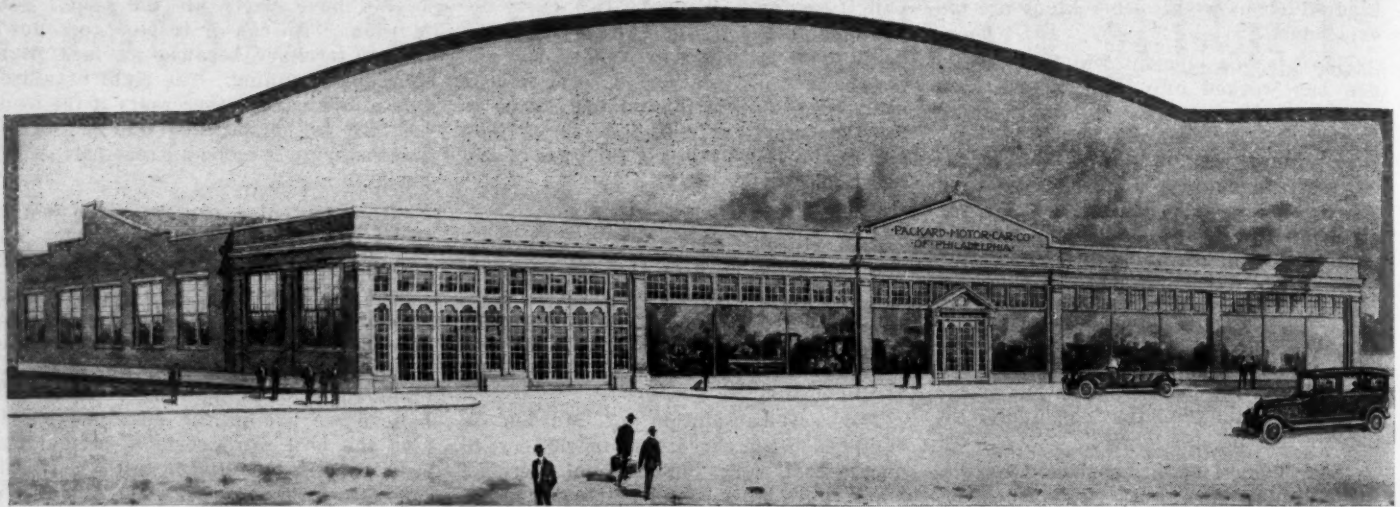
WHILE it is not the policy of the Dort Motor Car Co., Flint, Michigan, to establish factory branches, a peculiar situation, which calls for factory representation in New York City, has caused the company to open a branch at Broadway and 58th street.

The Dort company holds that developments during the past few months particularly since the signing of the peace treaty, have made New York the world's trade center and it was with this in mind that this company opens the branch and is now prepared to give export customers, dealers and Dort owners every advantage in service and co-operation that would not be possible under any other plan.

From the new branch the territory to be supplied is Manhattan, Long Island and portions of Connecticut and New Jersey, together with overseas customers who will make the port of New York their headquarters.



Exterior of factory branch opened by the Dort Motor Car Co. in New York to give service advantages to their export trade. Below, an interior view of the new branch



Build for Beauty as Well as Utility

ABOVE is shown how beauty and utility can be combined in a sales and service station. It is the Harrisburg branch of the Packard Motor Car Co. of Philadelphia and was designed by Philip S. Tyre, a Philadelphia architect well known to automobile circles and the designer of the famous setting for the Nineteenth Annual Automobile Show, recently held in the Commercial Museum, in Philadelphia.

The building will be one story high, affording plenty of floor space without the need of elevators. It will have a frontage of 185 ft. by a depth of 140 ft.

The design is one of the newest developments in garage and automobile serv-

ice building architecture. Tall Doric columns on the facade support large plate glass windows and a row of smaller windows above. The building is so constructed that an additional story can be erected on the supports provided.

The floor is divided into a showroom at the front of the building, 35 by 110 ft. This will be one of the best lighted and furnished automobile showrooms in the city. It is dressed in imitation cainstone with mosaic floors, woodwork of antique oak and bronze, indirect lighting fixtures.

In the rear of the salesroom, the garage and service floor provides 20,000 sq. ft. for the requirements of service and

storage. By virtue of its steel truss construction, posts have been entirely eliminated from the building plans of this enclosure, affording more floor space and less obstruction than otherwise would be possible.

Special lighting facilities have been provided, not only by large windows, taking up nearly the entire rear wall, but by skylights, providing an exceptionally well illuminated repair shop.

Machinery and equipment for virtually every automobile and truck repair job will be installed, with a large stock of extra parts for Packard vehicles, obviating any delay in providing replacements.

A Service Station Like This is a Credit to the Community

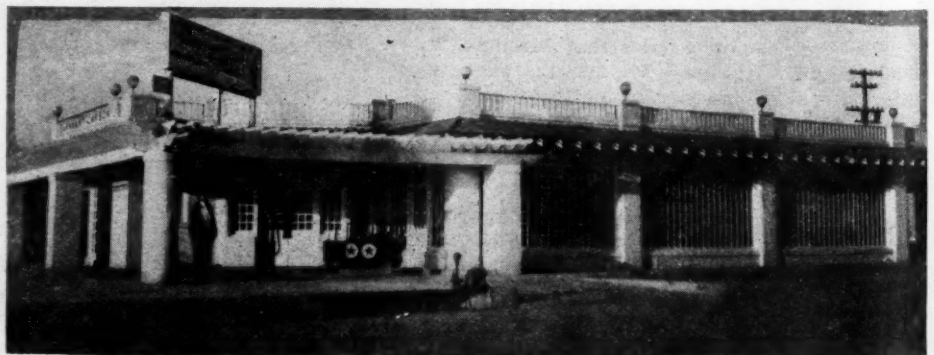
HOW two young fellows had a vision of how, with limited capital, it might be possible to develop a satisfactory and profitable business by devoting themselves exclusively to automobile equipment service, coupled with the necessary accessory business, has been demonstrated by the success which has come to the firm of Barnhart & Carson, Douglas, Ariz.

As will be noted by the illustration, the service station of this concern occupies a prominent corner and to outward appearance is the conventional drive-in gas station. However, to one side is the shop, which is very well equipped with machinery for ordinary repair shop work, while back of the oil station is the accessory department and a sort of open colonnade under which cars may be driven for inspection and quick repair.

Accessory stock to the value of about \$5,000 is carried, including a complete assortment of tires for the most popular cars used in that vicinity. The

room in which these are kept is large and well lighted and has the necessary show cases and shelving for the storage and display of the goods.

Service includes not only ordinary repair work on motor cars but also quick tire service within the city limits.



The appearance of this service station is all in its favor and is a decided asset in drawing business. An owner bringing his car in feels confident the work will reflect the same attention to detail and good workmanship as the building

In the shop are the necessary machines for complete tire service, including a vulcanizing plant, with the necessary appurtenances for that sort of work.

In addition to the two members of the firm the company employs three mechanics, whom it keeps busy most of the time. Repair service is rendered on the surrounding ranches, necessitating a good many miles of travel at times, and a service car and service truck are maintained for this purpose.

Making the Tractor More Comfortable

What a Farmer in Minnesota Has to Say Regarding the Lack of Driving Comfort in the Tractors of To-day



You would not think of buying a car to-day if you had to go back 15 years. You would not pay from \$1400 to \$3000 for a car without top, windshield or side curtains and have a cold rain hit you in the face—then what do you think of the man running a tractor 12 to 14 hrs. at a time, sitting on a little cold seat, open on all sides with a cold drizzling rain setting in when there is still a lot of plowing to be done?

MAX BROWN is a farmer who lives near Tenney, Minn., and like the progressive farmers of to-day believes in the tractor. But, like many other farmers, he wishes manufacturers of tractors would do more in the way of making it comfortable for the man who has to drive a tractor all day and sometimes at night. Anyone who has had to sit on the old-fashioned sulky plow seat all day under the heat of a merciless sun, or face a cold drizzling rain will agree that there is much to be done towards housing in the tractor driver. But read farmer Brown's story:

"I would like to say a few words in *MOTOR AGE*, in regards to tractors. I am but a farmer so cannot pen some fine article on tractors, but what I wish to say is from a farmer's experience and not from a salesman's point of view. It is something farmers who never run a tractor, never think of till too late, as during the time an agent shows off or demonstrates a tractor you will always find the weather fine, so what I have to say is from experience and I hope the tractor companies will see my point of view, and soon build tractors so as to be comfortable.

"I see lots of things about tractors, things some companies tell all about what a tractor can do, will do, and ought

to do, which is all very nice; have also attended tractor demonstrations showing what tractors will do, but there is one thing I wish *MOTOR AGE* would draw to the attention of the tractor manufacturers and that is in regards to cabs on their machines. I have run different makes of machines, the three and four plow sizes, and have yet to find one enclosed so as to be comfortable. Some are being made with top, but that is all you can call them, as the sides, front and back are all open. Up to a few years ago the manufacturers of tractors did not even put on seats on most of their machines, but expected a man to stand all day long or else make a seat for himself. Now they all have seats, but most are in name only.

"I wish the manufacturers would think more of the comfort of the man running one of their machines, remember he is only human and can stand but so much.

"The manufacturers expect a man to pay from \$1,000 to \$3,000 for a tractor, but tell me how they expect a man to run a machine twenty-four hours a day, 365 days a year but do not figure how a man is expected to sit or stand on a tractor all day or night as open as they are.

"What I wish the manufacturers of tractors would do is enclose them, that is the three and four plow sizes, for two

reasons: First, to keep out the cold and rain, and second, to make them safe in case a seat spring breaks, as you will notice lots of tractors. On some makes of tractors a man sits way out. Suppose while plowing, that spring should break, and the driver falls in front of the plows, drag or drill or whatever he's using, how much show has he got? Now, if that tractor was enclosed, there would have been no danger whatever. Now, in the three and four plow tractors which are used the most, why not put on a good cab with good seat, place windshields in front, with side, windows and door in back, so as to open handy, with window in door so as to watch plows, etc.

"Here is the way I look at it: You would not think of buying a car to-day. If you had to go back fifteen years, you would not pay \$1400 or \$3000 for a car without top, windshield or side doors, sit in the cold, have the rain hit you in the face.

"Then what do you think of the man running a tractor sitting on a little cold seat, open on all sides, twelve to fourteen hours at a time in October or November, a cold drizzle rain sets in, but having lots of plowing yet to do, and the tractor is running all right, sitting there all humped up, fingers stiff and cold,

(Concluded on page 37)



EDITORIAL



What of the Women Drivers?

MORE and more women are driving cars. To most women this is a new thing, but much more so the problem of keeping cars in order. Their cars will, at some time or other, have to be driven to a service station for repairs or adjustments. They will of necessity have to frequent the dealer's service station more than men drivers. The problem, then, is for the dealer to devise ways and means for properly taking care of the women drivers. Sometimes it is well to get the viewpoint of the individual in question and we believe the following communication from a woman driver may throw some additional light on the dealer's service problems:



"AS a driver of my own car, I feel that in writing this letter I am not only representing myself, but a large proportion of the steadily increasing number of women drivers as well. We who drive our own cars, and are entirely responsible for their care, are not only interested in keeping them in running order, but when that inevitable time comes for a visit to some service station, we are just as interested in knowing what is done to our cars while being repaired.



"ALTHOUGH attractive waiting rooms are very desirable, we do not expect, or even desire to be ushered into one of these rooms with the invitation to spend the time reading current magazines or otherwise wasting time which could be made very valuable if the service stations would only adopt the right attitude toward us.



"WHY NOT, rather, invite us to watch the mechanic do the work on our car? Perhaps had we understood the trouble, we could easily have made the adjustment our-

selves, thus not only eliminating an expense, but saving the time of busy mechanics for work of a more serious nature. As it is, things of a mechanical nature are not supposed to interest us, but it is my opinion that the type of woman who uses a car constantly in her business or otherwise, is just as interested in knowing how it runs and just what she can do to keep it running as any car owner.



"HOWEVER, if it is found that several hours will be consumed in making the repair, and would rather expect that the average service station had made provision for just such a condition as this. Perhaps at this time the demonstrator from the salesroom could come to our rescue and give us the use of some other car until ours was again available. This would be a service especially appreciated in the larger cities where transportation by other means often proves inconvenient.



"JUST one more thought, and while this comes last, it is by no means the least important of the services we would appreciate. Will we find some intelligent person ON THE JOB to direct us where to drive our car, assign some mechanic to do the work, give us an estimate of the length of time necessary to make the repair and in other courteous ways make us feel that our visit was not an unexpected or unusual occurrence, but one for which ample provision had been made.



"ARE THESE conditions, which as a prospective addition to this new class of service station customers, I will find actually exist?"

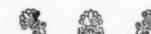
Enhancing the Value of Organization

AN organization, such as a Service Managers' association, or a Dealers' association is valuable only to the extent of the good that it gives. The interchange of ideas brought about through these organizations is also valuable, but this value is small unless a systematic presentation is made. To illustrate: At a meeting of a well known automotive organization, which was held recently, two valuable papers were presented in the same evening. Either of the two papers was valuable enough to have been presented by itself. The discussion had to be limited on each paper. The effectiveness of the discussion was only half what it should have been. There were many members present who had some good ideas to present on either of the subjects, but because of the attempt to crowd into one evening's discussion enough material to last any society several weeks, only a few members were heard from.



THE discussions which follow any paper on subjects as concern "Service," or "Engine Design" are the most valuable part of the meeting. By limiting the discussion, the

value is consequently reduced, and in the proportion to the number of different subjects presented.



IN OUR meetings, therefore, it is well to choose the subjects for discussion with care, and further, to present one subject, fully, completely, comprehensively, with every phase of the situation clarified; rather than present two or three ideas taking them up haphazardly and only in an incomplete manner.



IT IS disconcerting, to say the least, to change the trend of thought from, say, a discussion of the fuel question to the subject of truck maintenance, when the first subject had not even been broached, with many still waiting to be heard from. With the announcement of the second subject, the enthusiasm is killed. Thoughts still linger with the previous subject, incompletely discussed, and the effectiveness of the second subject is all the more reduced.



Motor Age, as well as every other business organization in Chicago, was badly hit by the railroad strike which tied up traffic last week, which will explain why your last week's copy arrived late. The railroad strike prevented all shipments of paper into Chicago and with the edition ready for the press last week, we were obliged to wait until we could get something to print it on. We finally located a supply of paper stock at Elkhart, Ind., and made arrangements to ship it to Chicago via truck. This truck above is one of the train of Motor Age trucks which brought us the paper

Railroad Strike Hits Motor Car Production

Detroit Factories Are Closed Down at End of the Week While Plants in Other Cities Are Almost as Badly Affected by Switchmen's Walkout

BY LAMBERT G. SULLIVAN



"It is impossible to forecast what the situation in Detroit will be if relief is not immediately afforded," wired our Detroit correspondent in answer to our request for a story. "All factories except Ford are at a complete standstill and there is considerable doubt if they will be able to resume operations immediately even if power is again supplied."

The situation in other cities is just as serious. Every report indicates that motor car production has been badly hit—how badly probably will not be known for several weeks.

IT is an intensely par-
lous undertaking in these unsettled days to prepare an article concerning the effects of a current strike. For by the time this story reaches our readers, the present "outlaw" strike of railroad switchmen may have been settled, or broken; all may be again serene in the industrial world, or some new conflagration broken out in some heretofore unthought of spot.

Automobile Production Badly Hurt

Whatever may be the situation, however, just put it down in the book that another whack has been taken at motor car production for 1920. A week ago we were in receipt of extremely optimistic reports from the principal manufacturing centers of the automobile industry. The program of 2,250,000 new cars for the current year was almost certain to be surpassed, said these advisers. Factories were speeding up and, despite minor labor difficulties, it looked as if the shortage of motor cars might be overcome within a year instead of the two years which seemed probable a short time since.

It may be that these optimistic prophecies will be fulfilled after all, but the railroad strike of the last fortnight has at least done its very best to prevent. The motor car industry has formed a habit of doing difficult things; of overcoming seemingly insuperable difficulties, but it has a giant's task on its hands this time. For the strike has caused a tremendous slackening of production at a critical period when it was vital that the factories be kept going at full tilt.

When we mention the motor car industry, we turn to Detroit as the Mohammedan turns to Mecca. And the status of the industry in Detroit at the present time is indicative of the industry throughout the United States.

Detroit felt the full effects of the strike almost immediately. An order

was issued April 12 by the Detroit Edison Co. that all power was to be shut off and that industries in the territory supplied by the company would either be forced to close down entirely or run on power generated in their own plants. As virtually all the automobile factories in

the territory depended upon this company as the main source of their power, the effect was immediate.

Full Effects to Come Later

Efforts were made by some of the manufacturers to install emergency power plants to meet the crisis, but even with this expedient it was possible to run only at about half normal capacity. Other companies accepted the situation without a struggle and posted notices informing their employees of their shutting down. Most of the factories were running at part production as the week ended, but it was virtually certain that unless relief afforded within forty-eight or seventy-two hours, the entire industry would be at a standstill.

While the actual number of employees thrown out of work cannot be accurately estimated, it is believed that at least



Carson, Pirie, Scott & Co., one of the west's leading dry goods concerns, was unable to obtain its goods by train and was forced to depend upon motor truck

50 per cent of the men employed in the industry affected. General Manager Haynes of the Dodge Brothers factory declared that 9000 of the company's 18,000 employees were affected and a canvass of the other factories indicated that virtually the same conditions prevailed elsewhere. The Ford Motor Co. main factory is operated by its own power, but the blast furnace and body plant are dependent upon the Detroit Edison Co. and at least 20,000 men employed by Ford are affected. In ability to get raw material or to store the finished product is expected to throw about 30,000 more out of work within the week.

250,000 Out of Work

Two days after the strike started it was estimated that between 80,000 and 100,000 men were out of employment in Detroit alone, another 35,000 in Flint, 10,000 in Pontiac, 4000 in Lansing and so on down the line. In the entire automobile industry in all parts of the country, 250,000 men out of work on account of the strike



Uncle Sam, as usual, found the motor truck indispensable to his mail service during the strike



Truck trains were sent hundreds of miles to unload stalled freight cars and bring their contents to the city

would be a conservative estimate.

When the strike started, most of the plants were just beginning to recover from the effects of the steel and coal strikes and had little opportunity to replenish their reserve stocks of materials depleted by these two strikes. They were, as a rule, running on a hand-to-mouth basis and even had they not suffered the loss of their power, undoubtedly would have had to curtail production on account of a lack of materials.

Even with an immediate settlement of the strike, the full effects of the strike cannot be overcome in the Detroit district for at least a month or six weeks. Most of the companies are down to the very last of their stocks and they will not be able to replenish these for

some time. When the strike is over, foodstuffs and other necessities of life will naturally be the first to move over the railroads and materials for automobile manufacture will have to wait until the accumulation of these necessities has been cleared away. In view of the fact that the railroads have proved inadequate to handle even the normal flow of their business, it may readily be seen what the automobile industry has to face with the roads trying to clear up an accumulation.

Other Cities Hard Hit

Other centers of the automobile industry were almost as badly affected at Detroit. Indianapolis manufacturers faced the probability that they would have to shut down entirely unless a settlement is arrived at within a day or two. The manufacturers, naturally, are not prone to tell just exactly how serious their situation is, but they admit that they cannot possibly go along more than a week on their present stocks.

Gets Data on Effect of Weather on Various Roads

Arkansas Weather Bureau Official Compiles Figures
As to Effect of Rain on Different Types of Paving

REALIZING the need for up-to-date and reliable information on highway conditions, an effort has been made to determine the effects of rainfall on highways so that reports of rainfall may be adapted and utilized in determining road conditions. The following results apply to dirt highways in Arkansas and were obtained after a study of replies to questionnaires mailed to co-operative observers, meteorologists, engineers, crop correspondents and others familiar with highway and weather conditions in the communities in which they live.

It should be remembered that all the results are averages and that only reliable estimates in measureable amounts of precipitation were used to obtain the figures. The average opinion of the correspondents is that 1.38 in. of rainfall make dirt roads muddy; those located in the lowlands estimated that 1.13 in. were the required amount; in the uplands, 1.51 in. They estimated that

By **TRUMAN G. SHIPMAN**

Observer, Arkansas Weather Bureau

2.78 in. of rainfall make dirt roads very muddy; those in the lowlands, 2.25 in. and those in the uplands or hills, 2.90 in. The variation for surface conditions is 29 per cent in both cases. It is interesting to note it requires about twice as much precipitation to make dirt roads very muddy as to make them muddy. The estimated amount required to make dirt roads impassable average 4.04 in., varying from 3.57 in. for the lowlands to 4.35 in. for the hills or uplands. By impassable, is meant that automotive and the heavier horse-drawn vehicles cannot get through as the lighter horse-drawn vehicles usually can. The results apply mainly to late autumn, early winter and spring conditions.

The estimated length of period with intermittent light to moderate rains and cloudy weather that makes dirt high-

ways muddy was 2.6 days; to make them very muddy, 5.0 days; impassable, 6.5 days. These results may be used in counting accumulated rainfall when the required amounts to change conditions do not occur in a shorter time. It was learned that one more day's rainfall could be used in computing impassable conditions for the lowlands, as the accumulated amount was more effective in producing changes on account of soil and drainage conditions.

The above figures may be used in determining highway conditions from rainfall reports. If the latest advices showed the highway in fair condition and 1.13 in. of rain have fallen since then, the highway will be muddy; if 2.25 in. have fallen, the highway will be very muddy; if 3.57 inches have fallen, the highway will be impassable. Lowland figures have been used in the illustration and if upland figures are desired the necessary percentages should be added.

Canadian Border Towns Plan to Build 1000 New Homes

Fund of \$5,000,000 to Be Provided to Aid Workers in Windsor, Walkerville, Sandwich and Ford City Solve Housing Problem

WINDSOR, Ont., April 20—One thousand homes of all sizes and prices will be erected in the border cities (Windsor, Walkerville, Sandwich and Ford City) this year, according to plans being formulated by the border chamber of commerce, the city council and different manufacturers. The actual cost will be about \$5,000,000 of which Windsor will provide \$2,000,000 for 500 houses, Walkerville \$1,500,000 for 300 houses, Ford City \$500,000 for 100 houses, and Ojibway \$500,000 for 100 houses.

A housing company known as the Border Housing Co., of which Hiram Walker of Walkerville is a member, and composed of officials of the larger manufacturing plants, members of the border chamber of commerce and any one else who is interested in housing. The manufacturing plants will contribute to the building of houses according to their needs.

Howard E. Blood, general manager of the Canadian Products Corp., one of the members of the company, declares that the critical housing situation nullifies any attempt on the part of the corporation to expand and that such a thing was out of the question until more housing accommodation was provided.

Maj. B. W. Vallat, general manager of the Dominion Forge and Stamp Co., one of the largest plants along the border,

is also behind the scheme and stated that his company would welcome any scheme which would provide more houses for its employees.

All of the manufacturers are loath to go into the housing business themselves because of the experience of the General Motors Corporation and other large companies in like ventures in the United States.

At a meeting of all those interested in the housing question, called by Mayor E. B. Winter of Windsor, the possibilities of the passing of the new housing act, which has received its first reading in the legislature, was discussed, and those present believe that on the result of this bill would hang the fate of the new housing scheme. By the provisions of this bill municipalities will be enabled to borrow for housing purposes and the government will guarantee the debentures.

W. E. Gundy, chairman of the Windsor housing commission, and who has an office in Toronto, stated that he understood that considerable opposition to the bill was coming from Toronto, although he was at a loss to understand why this should be when Toronto needed houses almost as badly as the border municipalities.

To give the bill as much support as

possible a resolution was passed to be sent to the Drury government, urging the speedy passing of the bill. The resolution was also sent to Major J. C. Tolmie, member for Windsor.

ORGANIZE NEW AIR SYNDICATE

Cincinnati, O., April 20—The Western Air Line Syndicate was organized in Cincinnati this week for the purpose of placing airplane transportation lines in operation between the cities of the Middle West. The capitalization is \$2,000,000, and a charter will be asked of the Secretary of State next week.

Contracts for carrying the United States mails will be sought by the new company. Fred M. Renshaw, Traffic Department of the Chamber of Commerce, is working with the Chamber of Commerce in other Middle West cities to ascertain from manufacturers just what tonnage is available for these lines and its class.

Those who joined in organizing the company included officials of the Cincinnati Aircraft Company, members of the Chamber of Commerce of Cincinnati, and the following out-of-town men: O. C. Johns, Erie, Pa.; F. C. Wells, Chicago; W. A. Hubbard, Louisville, Ky.; Frank Bernstein, Indianapolis, Ind.; C. C. Berry, St. Louis, and G. F. Thomas, Cleveland.

Brockman Is Elected to Head St. Louis Dealers

**Annual Convention of Association
Selects Overland Man,—Ac-
complishments of Year
Told**

ST. LOUIS, April, 20—Philip H. Brockman, president of the DeLuxe Automobile Co., Overland distributor, was re-elected president of the St. Louis Automobile Manufacturers' and Dealers' association at the annual meeting last Monday. George Weber, president of the Weber Implement and Automobile Co. was elected vice-president, and W. L. Johnson, president of the Johnson Automobile Co., treasurer. All of these men were elected by acclamation, their opponents withdrawing.

Directors were elected as follows: L. H. Amrine, Scudder Motor Truck Co.; Webster Colburn, Dorris Motor Car Co.; R. C. Frampton, Hudson-Frampton Motor Car Co.; H. G. Hurd, Buick retailer; J. T. Salisbury, More Automobile Co., and Joseph A. Schlecht, Mound City Auto Co. and Schlecht Motor Car Co.

Secretary Robert E. Lee reported that the association now had a membership of 80, an increase of 25 since April 1, 1919. Capt. Lee reported that "the association is in a strong position financially, and its standing in civic and business affairs is such that few matters come up in St. Louis, but that we are consulted about them." During the year the association invested in \$2500 worth of Victory loan bonds, donated \$2000 to the Federated Roads Council of Missouri and \$1000 to the fund to advertise St. Louis. The president and secretary and some of the members, the report adds, attended a number of hearings by the Board of Aldermen on street openings and widenings and have otherwise represented the association wher-

ever their presence seemed important.

The legislative committee: J. T. Salisbury, chairman; Frank R. Tate and Webster Colburn, recommended that the president appoint a strong and active legislative committee, because it has been advised that there will be a large amount of legislation before the Missouri General Assembly, which meets in January, 1921, against the motor car. Here is what the committee did during the year:

Defeated the bill before the Board of Aldermen which required that every person driving a motor car in St. Louis must purchase a license and pass an examination.

Killed the bill which permitted physicians to have special parking privileges without limit in the congested sections of the city.

Attended and took part in the discussions in regard to the opening of Twelfth street to the northern city limits, the opening of Twelfth street, through to Gravois avenue, and the widening of Olive street.

Secured the passage of a bill to make an opening from Pine and Chestnut streets east into West Pine street.

Persuaded the four big gasoline companies to pay the one-half cent tax to the city, the proceeds to be used in repairing streets.

Kept in touch with the street department in regard to street repairs and construction.

TRUCKS TO CARRY FOOD

Philadelphia, April 20—Gov. Sproul is staying in this city for the next few days, as the main food distributing center of the state, to see that, in case the railroads are further handicapped in getting food shipped by the steam roads, he can call into instant requisition the large number of motor trucks owned by the state.

The two motor truck associations of this city have offered their services.

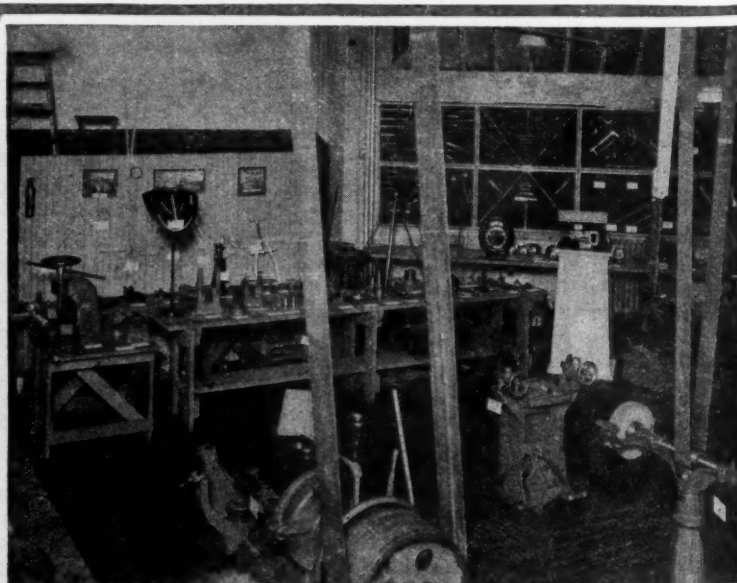
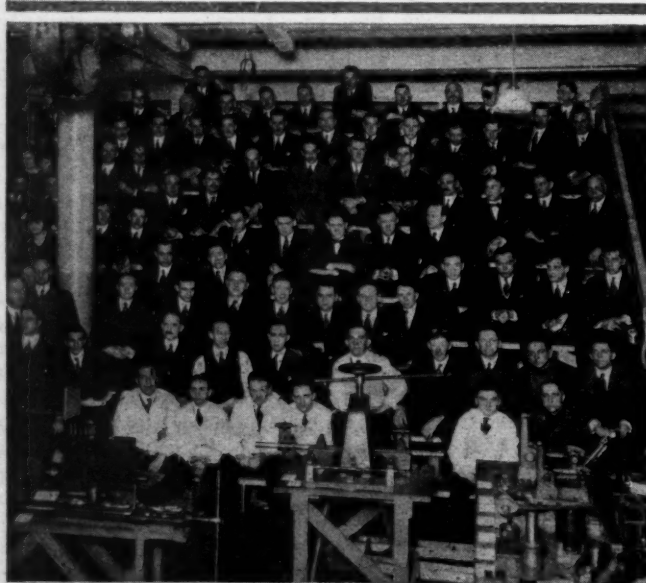
New Motor Car Risk Rates Are Announced

**Collision Rates Advanced and General
Increases Are Found in
New Schedule of Com-
panies**

NEW YORK, April 19—New insurance rates on automobiles for public liability, property damage and collision hazards prepared by the National Workmen's Compensation Bureau, became applicable to all new business April 15, and will apply to all renewals dating from June 1. Features of the new rates are a moderate increase for public liability on passenger cars, a substantial increase in public liability rates on commercial vehicles, and a radical increase in collision rates for all classes.

General rate increases will be found to be principally applied in the congested traffic territories. This amounts to about 10 per cent for passenger cars and approximately 35 per cent for commercial. The new rating continues the car valuation as the basis, but by establishing a key symbol for each make of car has obviated the defect in last year's system, which resulted in an advance in the premium rate every time the maker of a car advanced his price.

Collision rate advances are based on unprofitable experience of all companies and while varying greatly according to the types of cars, on the whole amounts to at least 40 per cent over last year's rates. The property damage rates are based upon the inclusion of loss of use liability and are slightly less than last year's rates for the two hazards combined. Territories have been slightly modified, but in general conform to last year's boundaries, with the important exception that a new intermediate territory between six and seven has been created.



The Service Station Equipment Division of the Fairbanks Co. recently met at New York. At the right is a display of some of the company's equipment devices

Trucks Held to Blame for Misuse of Roads

Several States Declare Overloaded Vehicles Are Causing Damages to New Highways

NEW YORK, April 18.—Highway organizations here and throughout the country are receiving many complaints of roads badly damaged by heavy truck traffic. The condition has been aggravated by the greatly increased truck business resulting from railway congestion and the necessity of getting goods distributed by the only reliable means at hand.

Even the most enthusiastic of good roads partisans did not foresee the tremendous development of motor truck transportation which has come in the last two of three years, but which still is in its infancy. The result is that roads built in the old style have been unable to carry the burden placed upon them.

There is apparent, however, no disposition to curb the use of trucks. The chief result thus far of road damage has been legislation enacted in several states to limit the weight of trucks and to limit the maximum loads they may carry. These limits in some cases are less than those set by the National Automobile Chamber of Commerce in its proposed uniform vehicle law which set the maximum weight of vehicles at 28,000 pounds and of loads at 800 pounds per inch width of tire upon any wheel concentrated upon the surface of the highway.

The only solution seen by highway experts for a problem which is becoming manifest in all parts of the country is a virtual reconstruction of the entire highway system, which will entail tremendous expense and which will have to be done gradually. It has been demonstrated that the old type road construction is inadequate to present needs on roads upon which traffic is heavy.

It is contended that only such types of materials as granite block, concrete and wood block should be used on the main arteries of travel and it also is asserted with the utmost emphasis that with good roads building costing as much as it does now routes should be laid out with regard only for economic considerations and the serving of the largest number of persons. It is held that if the country is to be provided with a highway system adequate to its needs highway building must be divorced absolutely from politics and political patronage. Enormous sums in the aggregate have been spent in the past in building good roads which serve only a few people and which are not

likely to increase greatly in usefulness in the near future.

TO DEVELOP CANADIAN OIL

Winnipeg, April 20—Manitoba and western Canada possesses an inexhaustible supply of petroleum, which is now to be worked by the Anglo-Dominion Petroleum Co., and Winnipeg is likely to become one of the great oil distributing centres in the North American continent, A. S. A. Coyne, managing director and Canadian financial commissioner of the company, who is in Winnipeg, announced to-day.

The operations of the company will commence on and around the Athabasca river in September. It has an initial



We wouldn't go so far as to say that present prices of gasoline have discouraged even John D. Rockefeller, Jr., but we do know that on his recent visit to Chicago the son of the Oil Croesus used an electric for his urban amblings

capital, underwritten by important British oil interests, of \$5,000,000 which will be increased to \$25,000,000 in August.

NASH TO BUILD BIG SALESROOM

Cincinnati, O., April 20—A new "Automobile Row" for Cincinnati became a possibility this week when it was announced that a syndicate of Cincinnatians would erect one of the largest automobile salesrooms in Cincinnati at Reading road and Morgan street for the Nash-Cincinnati Motors Co., both wholesale and retail divisions. It will include 30,000 sq. ft., be of concrete, fireproof construction, and will be leased to the Nash company for \$15,000 a year.

Cincinnati Plans for Municipal Garage

Eastern Capital Is Interested in Erection of \$5,000,000 Structure for Downtown District

CINCINNATI, O., April 12—Cincinnati may soon have a public garage building which will surpass any structure of its kind in the country and even take the palm away from Cleveland, which has been unusually proud of the dimensions and appointments of the large public garage building recently erected in that city. Following the visit here earlier in the week of C. T. Abele, representing Eastern financiers who will furnish the money for the structure, it was learned that a 15-story public garage building may be built on Fourth street, near Main, starting within 60 days.

Under plans at present outlined, the building will be underwritten for \$5,000,000 and will be constructed entirely of steel, concrete and glass. It will contain besides the garage feature, a large modern theater and a number of offices. The theater, it is reported, will be under control of the Shuberts, who have announced their intention of erecting in Cincinnati a new, modern theater to house their productions.

The garage will have a seating capacity of several thousand cars and will have an imposing main entrance on Fourth street. It is reported that all options have been secured on the property sought and arrangements made for building and contracting materials.

This is the third large garage project that has been announced since the announcement by city officials recently that an ordinance will soon be passed prohibiting all parking on down-town streets.

The Cincinnati Automobile club, at its meeting last night, took under consideration several plans that have been proposed for a combination garage and club rooms of its own. One of the plans is for a seven-story garage with club quarters above Ninth street; another for a four-story garage on Fourth street, with an entrance on Third. Each building would house 1500 automobiles. The other plans were not made public. Another meeting of the club was called for April 21 to reach a decision.

PROTEST FORD CONDEMNATIONS

Detroit, April 16—Property owners in the vicinity of River Rouge are protesting the condemnation of land adjacent thereto on the ground it will benefit no one but Henry Ford, and that it will be disadvantageous to private interests.

Kansas City's Unite in Promoting Extensive Road Work

KANSAS CITY, Mo., April 16—The Chambers of Commerce of Kansas City, Mo., and Kansas City, Kans., have got behind the Good Roads association of Greater Kansas City, endorsing completely the latter's most extensive suggestion for promotion of highway transport and road-building. The chamber will conduct a campaign to raise \$100,000 for the association's program. This program includes about \$40,000 to assist Missouri and Kansas in the putting over of constitutional amendments for large bond issues this fall; \$20,000 for making repairs, and contributing to repairs, of short stretches of road within 125 miles of Greater Kansas City, which mar otherwise through good highways; marking of highways in the territory; maintenance of a news bureau for stimulating interest in good roads throughout the territory; preparation and issuance of maps and literature on roads and their uses.

The Good Roads association of Greater Kansas City was organized in December, by representatives from various civic bodies of Kansas City, called together by the Good Road Committee of the Chamber of Commerce. The chamber's good roads committee, having tackled the subject of highway transport and road development, had seen the need of a great organization, with ample funds, to handle road matters for a large territory, and therefore made the plans for the enterprise that is now being equipped to do the broad work.

A preliminary organization had been effected by means of a joint committee of the Chambers of the two Kansas Cities, which started return load bureau activities for the territory. When the Good Roads association was organized, its scope was designated as a district in a radius of 100 miles from Kansas City. J. Frank Smith, formerly manager of the Good Roads association of Kansas, was employed as manager; funds for the first few months' work, which was to demonstrate the utility of the association, were raised by the membership plan, several thousand \$1 members being secured, and a few large subscriptions obtained. Mr. Smith was able to perform so much real service for the communities of Missouri and Kansas, that the usefulness of the association was fully demonstrated to the business men of the entire Kansas City territory, and especially to the business men of the population center.

The association had prepared a program involving an expenditure of \$100,000 with only faint hope that such a sum could be raised; it offered a smaller program, for which \$10,000 or \$15,000 would suffice. But the Chambers of Commerce saw the need of the biggest kind of effort, and adopted the \$100,000 plan.

The directors of the association, elected by representatives of the civic

bodies of Kansas City, are: Estel Scott, truck distributor (president), and R. C. Greenlease, motor car dealer, from the Motor Car Dealers association; Albert Mebus, insurance agent (vice-president), and C. N. Prouty, banker, Kansas City, Kan., Chamber of Commerce; S. C. Blackburn, transfer and storage, and Geo. D. Hurley, lumber, Kansas City, Mo.; Chamber of Commerce, and Wm. A. Knotts, lawyer, Kansas City Automobile club. Mr. Knotts is treasurer and Mr. Hurley secretary of the association. The Automobile club has provided quarters heretofore for the association.

FRENCH FORD PLANT BURNS

Paris, March 20.—The body assembly shops of the Ford Motor Co. at Bordeaux have been completely destroyed by fire. This will delay the delivery of finished cars, but will not in any way affect the production of chassis. The Bordeaux factory of the Ford company is for assembly purposes only. Cars are received here knocked down and are put together in these shops and delivered to clients.

MICHELIN HEADS AIR CLUB

Paris, March 17—Andre Michelin, the tire king of France, has been elected president of the Aero-Club of France, replacing the late Henri Deutsch de la Meurthe.

Andre Michelin has been a strong supporter of aviation from the beginning of

the movement. In 1908, he offered a prize of \$20,000 for a flight from Paris to the top of the Puy de Dome mountain. The same year he offered the Michelin Cup for the longest non-stop flight. In 1912, he founded the bomb dropping prize, which was won by Gaubert and Scott. Since the armistice, he has offered a prize of \$100,000 for the first aviator who can fly at a maximum speed of 120 miles an hour, minimum of 6 miles an hour, and land in an area of 5 yards.

During the war Andre Michelin assisted in the development of the Breguet biplane, which became the most successful bombing machine of the French army, and was also used extensively by the American army.

TORONTO DEALERS IN ELECTION

Toronto, Ont., April 19.—The Toronto Automobile Trade Association, Ltd., recently elected the following directors and officers for 1920: W. J. Bedwell, G. E. Gooderham & Co., 97-105 Richmond St. W.; R. C. Kilgour, Ontario Motor Car Co., Ltd., 18 Bloor St. East; G. M. MacWilliams, Hyslop Bros., Ltd., 12-20 Shuter St.; C. M. Ricketts, McLaughlin Motor Car Co., Ltd., 128 Church St.; H. D. Scully, Willys-Overland Ltd., 100 Richmond St. W.; Arthur Sharpe, Wolseley Motors Ltd., 81 Avenue Road; A. M. Thompson, Dominion Automobile Co. Ltd., 150 Bay St.; G. M. MacWilliams, President, Hyslop Brothers, Ltd., 12-20 Shuter St., A. M. Thompson, First Vice-President, Dominion Automobile Co. Ltd., 150 Bay St.; R. C. Kilgour, Second Vice-President, Ontario Motor Car Co. Ltd., 18 Bloor St. East; W. J. Bedwell, Secretary and Treasurer, G. E. Gooderham & Co., 97-105 Richmond St. W.

Indiana Roads Become a Mere Political Issue Now

INDIANAPOLIS, Ind., April 20.—The Indiana state highway system is becoming the football of state politics. In the approaching campaign, the question of highways for Indiana is to be a big subject as a vote-getter.

The state highway commission, which has served under the Republican Goodrich administration is being criticized by Democrats for having awarded in 1919 contracts for 113,429 miles of paving at a rate approximately \$6,191 more than the basic average cost of similar paving in Marion county, in which is located Indianapolis, in the same period of time.

These contracts cost the state of Indiana \$702,238,939 more than similar, but better, than paving would have cost had it been obtained at the price paid per mile by Marion county.

If contracts for the 3,200 miles of the state highway system are paved at the same ratio of cost that prevailed in 1919, they will cost the state \$19,811,200 more than Marion county has demonstrated a fair price for them, it is said.

These figures are from a detailed re-

port of the operations of the commission, prepared for Dr. Carleton B. McCulloch, democratic candidate for the nomination for Governor. Dr. McCulloch in his speeches over the state says the information is sufficient to warrant a complete investigation to find why the state is spending so much for what appears an inferior type of road.

NO NEW BERLIET THIS YEAR

Paris, March 20.—Berliet, who nearly a year ago announced that he would produce a low-priced 15 hp. touring car on American lines, now states that this machine will be held back for one year. This has been done in order to enable the factory to work exclusively on trucks, which are being produced at the present time at the rate of thirty a day.

The original plan was that the 15 hp. touring car should go into production at the rate of ten to twelve a day with a rapid increase to 100 a day. This car is decidedly on American lines; it has a comparatively big four-cylinder engine of 3½ by 5.1 inches bore and stroke, it is

provided with an American made lighting and starting set.

A new factory has been erected since the war with an area of sixty-two acres for the construction of this car. This surface covers the shops only. The total area covering workmen's dwellings, co-operative stores, and other buildings being 100 acres.

Virtually the whole of the engineering industry of Lyons is held up by a strike. Only two or three per cent of the men are at work at the Berliet factory, and production is practically nil.

PLAN AERIAL FREIGHT LINE

Louisville, April 19—Freight and passenger airplanes, plying daily from Detroit to Jacksonville, stopping en route only at Louisville, is the plan of the Universal Aviation Co. Ltd., of London, England.

F. M. Deeds, representative of the concern, said last night at Hotel Henry Watterson that nine airplanes would be used, and that the eight-hour trip would include a stop of one hour here if a suitable landing place could be found.

This company has been maintaining an air service from London to Paris and London to Bordeaux for the last year. Mr. Deeds said that city officials here had encouraged him in the plan, and it was possible that Louisville would have a municipal landing place to provide for the predicted increase in aviation activity next year.

If negotiations are completed, Mr. Deeds said, the first plane will land here about June 1. Caproni triplanes will be used. Hydroairplane service is planned between Detroit and Cleveland by the same company.

Montreal Dealers Hold "Get Together" Convention

MONTREAL, April 19.—The "Get Together" dinner of those engaged in the motor trades industry, held in the Windsor Rose room this week, was unique. The president of the Montreal Automobile Trade association, Chairman J. R. Marlow, struck the keynote of the program when he said: "We have pulled apart in the past, now let us get together and work together."

There were two chief speakers, M. K. Pike, of the Northern Electric Co. and J. R. Marlow of the Willys-Overland, the latter acting as chairman. In addition to these, brief remarks were made by W. Jennings and Victor Lovesque, in toasting the association and sister associations respectively, and interesting replies made by J. O. Linteau, J. Ernest Miller and Capt. J. Duchastel de Mont-rouge, who spoke as the vice-president of the Automobile Club of Canada.

Mr. Pike spoke on co-operation within the trade and the advantages of working together. Mr. Pike warned the diners that only by business-like methods, fair dealings and pulling strong together

Kentucky Truck Dealers Start Annual Demonstration Tour

LOUISVILLE, April 19—The Central Kentucky Truck Dealers' association to-day started a "Farm Truck Demonstration" tour. The motorcade is composed of a large display of pneumatic-tired trucks, trailers and other hauling equipment. The fleet is valued at over \$100,000 and will be accompanied by a band that gives concerts all along the route.

This tour is for demonstration purposes; no particular truck, trailer or tire will be advertised, nor will any sales be solicited. The purpose of the tour is to boost good roads, speed up production, demonstrate that trucks can be used for all kinds of work in the rural sections and prove that cost of operation is considerably less than the old methods. Speakers of national reputation accompany the tour to explain the important part being taken by the motor truck in solving the country's transportation problems. Free demonstrations will be given on farms, on plantations and at industrial plants to show that the pneumatic tired truck is faster, costs less to operate and does not do the damage to highways that other vehicles do.

The tour is to cover 268 miles in six days, and the dates and towns to be visited follow:

April 19 — Nicholasville, Wilmore, Shakertown, Harrodsburg.

April 20 — Perryville, Danville, Bryantsville, Lancaster.

April 21—Paint Lick, Richmond, Berea.

April 22—Whitehall, Winchester.

April 23—North Middletown, Millersburg, Cynthiana.

April 24—Jacksonville, Centerville, Paris. Returning to Lexington in afternoon for parade and demonstrations.

Maj. Thompson B. Short, who was with the government during the war and had charge of large convoys of trucks in this country, as well as at Brest, France, will be tourmaster and have complete charge of the tour while en route.

Committees have been appointed in all the places to be visited who will welcome the visitors and arrange demonstrations.

CLUB GETS CENTRAL GARAGE

Cincinnati, O., April 20—A large downtown garage with clubhouse facilities for the Cincinnati Automobile club was practically assured to-day when the directors of the club directed President C. L. Bonifield to call a special meeting of the club members for next week, to make a final decision. This means that the club has abandoned a tentative plan to establish its headquarters in a new garage that is to be erected soon, and has returned to its original plan of a garage and clubhouse of its own. Options have been secured on a tract easily accessible to the business district, but the location is being withheld temporarily. The club has approximately 5000 members.

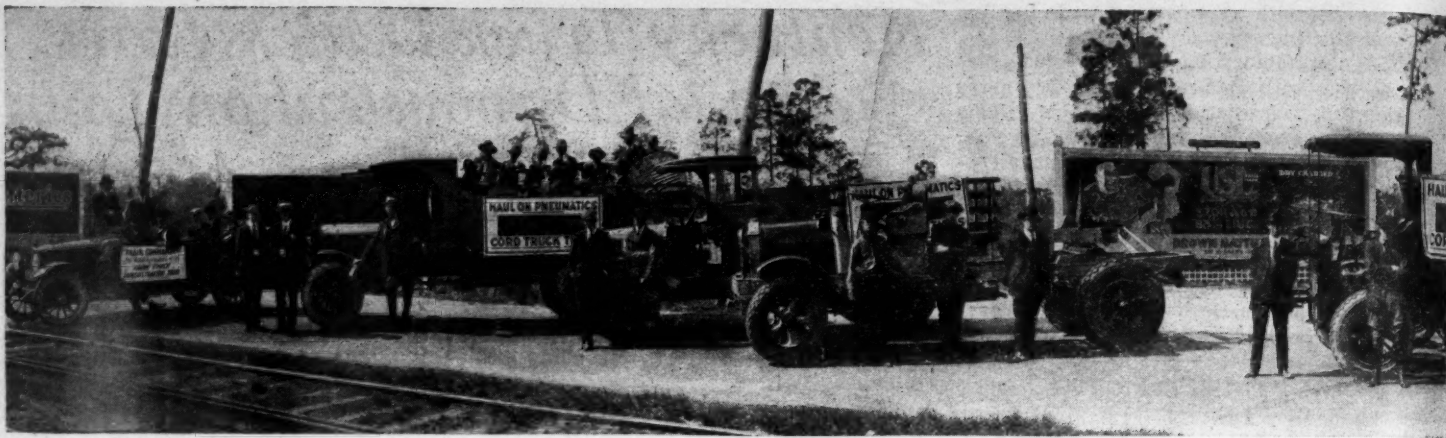
PARRETT TRACTOR CO. TO EXPAND

Chicago, April 17—Expansion of manufacturing activities is to accompany the reorganization of the Parrett Tractor Co. The company will continue the manufacture of the Parrett tractor on a larger production basis and will also put on the market a Parrett motor truck especially adapted for farm use and a motor cultivator.

Vincent Bendix has been elected president of the company to take the place of Dent Parrett, who recently resigned to devote all his attention to other activities. George Gibson, Robert Barbour and Russell Reed, vice-presidents, Curtis Booth, treasurer, and W. J. Buettner, secretary. All have had long experience in automotive and industrial circles.

FORD BAND ON MICHIGAN TOUR

Detroit, April 16—Edsel B. Ford, president of Ford Motor Co., will send the Ford band of 55 pieces and a staff of motion picture operators with the annual tour of Michigan Pikes association July 14 to July 29. About 300 will join the tour, which will cover 1,359 miles in the 15 days, 574 of which will be in Michigan and 785 in Ontario. A fleet of trucks carrying tents and full camping equipment together with a farm lighting system, fire engine and facilities for tire and general repairs, and for the installation of shower baths will be at the head of the party.



Jacksonville, Fla., opened the season for farm-truck demonstration tours. This photograph shows a section of the motor caravan, showing

Charlottetown Show Marks Canadian Motor Progress

Exhibit of \$75,000 Worth of Cars on Prince Edward Island Where They Were Barred in 1915

CHARLOTTETOWN, P. E. I., April 12—The second motor show was held in this city the past week when \$75,000 worth of cars were on exhibition. This illustrates the progress made in removing the barriers of prejudice. Only a few years ago, the sight of an automobile to farmers in some sections of the country would be as a red rag to the said farmer's bull. Parts of the island were fenced off, figuratively speaking, from cars. In other places they were limited to three days a week, and were forbidden to run certain hours on Sunday.

At the general provincial elections of 1915, a number of the candidates before being nominated were compelled to sign pledges that they would support prohibitory automobile legislation. Now all is changed. The Province is thrown wide open to motor cars. They can run on any road in any hour of the day. Even the ban imposed by the Province of Nova Scotia for the months of March and April has not been adopted in Prince Edward Island. Of course, the usual reasonable regulations as to speed are in force. Although not announced by the Commissioner of Public Works it is an open secret that the Government proposes to capitalize the revenue derived from automobile licenses, and borrow a sufficient sum to enable them to secure the forty per cent, given by the Dominion government as a grant towards highways, on condition that the Province put up sixty per cent.

It is expected that the automobile revenue will pay the interest on the loan and leave enough over to create a sinking fund to meet the debentures when they become due. Last year there were over one thousand cars registered in Prince Edward Island. This year there will be several hundred or more. The island had the greatest percentage increase of any Province in automobile

registration, namely, one hundred and twenty-three per cent, Quebec coming next with thirty-four per cent. The value of cars on Prince Edward Island to-day represents over one million dollars, and is an index of the prosperity enjoyed in this Province. It is a significant fact that the great majority of the cars are of a better type possibly, the percentage of the lower-priced cars being smaller than in any other Province. Last year there were imported to Prince Edward Island 600,000 gallons of gasoline. There is an active automobile association that has done much in popularizing the motor car and removing the prejudice that has heretofore existed against it.

THE PNEUMATIC TRUCK TIRE

(Concluded from page 10)

makers exhibited trucks with pneumatic tires, out of a total number of 70 exhibitors. These 45 makes did not by any means represent the hold that the pneumatic tire already has on the truck industry. There were 41 other makers, not at the New York Show, who are fitting pneumatic tires. This gives a total of 86 truck makers in January, 1920, who were fitting pneumatic tires. Do not infer from this that their entire output was fitted with pneumatics. The figures indicate that this number of makers was fitting some pneumatics.

Farmer Appreciates Advantages

That the farmer is aware of the merit of the pneumatic is indicated by some recent figures obtained from 3700 different farmers scattered throughout the country. The majority of these are favorable to pneumatics. The farmer has found that a truck allows him to use other markets more remote from his home. The pneumatic tire permits the load of produce to reach the market in a better condition. There is less shrinkage in the product. Better prices are obtained. The farmer is interested in trucks of 1, 1½, and 2-ton capacity. More want a 2-ton truck than a 1-tonner. Many farmers are able to do with fewer horses and fewer workers by virtue of the truck.

Trucks Are Blamed For Ruining Connecticut Roads

Overloading of Commercial Vehicles Held Responsible for Damage of \$100,000 to Thoroughfares

HARTFORD, Conn., April 18—According to State Highway Commissioner Charles J. Bennett, the roads of Connecticut have been damaged already to the extent of \$100,000. This damage the commissioner lays at the doors of heavily loaded motor trucks, a large percentage of which are from other states. The commissioner reported his findings to the state motor vehicle department and inspectors were posted at various points to check up loads.

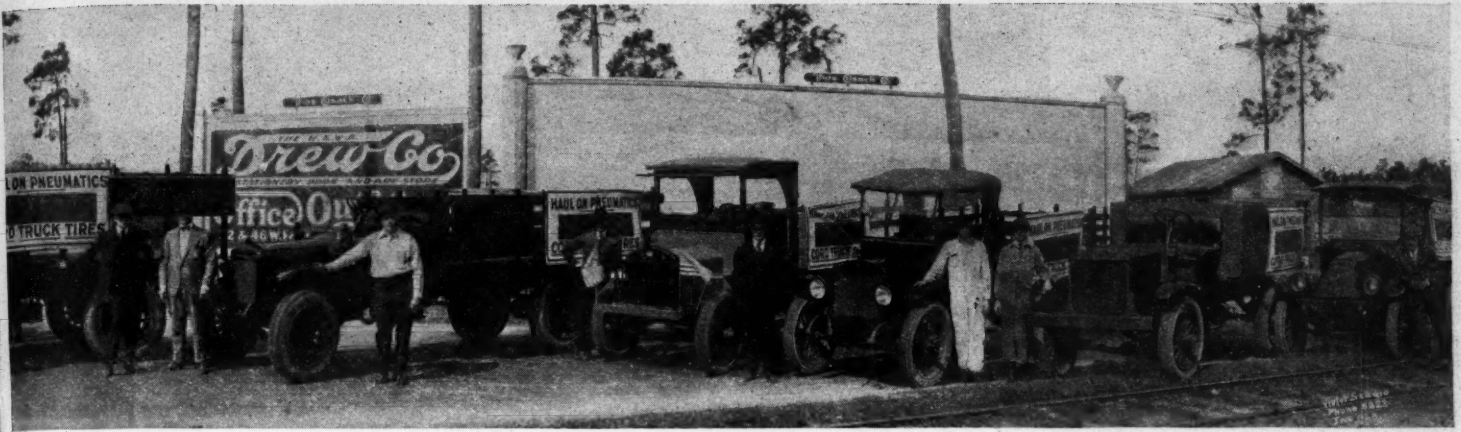
In Clinton the mud was so deep and soft that the highway department kept trucks on duty to pull others out of the holes. Further down the line an enterprising farmer kept a yoke of oxen handy and turned his Sunday efforts to account to the tune of \$23. On the Wilimantic turnpike several owners of horses bid for trade in pulling cars out at \$1 per pull. They did not lack for custom.

The state roads this season are in worse shape than they have ever been in past years. The winter has had a telling effect and cars as well as the roads have been damaged. On the Newfield road a farmer came to the rescue and not for profit with his Cleveland tractor and was able to get trucks out of the holes that proved too much of a task for other trucks.

The Berlin pike, the main artery south, is practically impassable and traffic is being diverted.

WORK ON HANDLEY-KNIGHT

Kalamazoo, Mich., April 20—Steel for the new Handley-Knight Automobile Co. has begun to arrive, and work on the building is being rushed as rapidly as possible. Grading, excavating and concrete work practically has been completed. Pres. Handley announced today that the engineering department had decided to use Timken axles on all models.



how the dealers took advantage of the opportunity to bring home to farmers along the route the value of their commodities

St. Louis Tire Dealers Improve Trade Conditions

Take Action To Do Away With Present Abuse by Customers of "Free Service" Privilege

ST. LOUIS, April 16—The St. Louis Tire Dealers' association, organized several months ago, has taken another step forward in the making of better business conditions in that trade. Several weeks ago, it decided to prepare a list of "dead beats," a pest more numerous in the tire trade than in any other branch of the automotive industry. The list has been prepared, and for this class it will mean no service unless previous bills are paid.

Now it is the free-service problem, the bane of the existence of the tire man, that has been tackled, and tackled in earnest. At a meeting on Friday, the association decided to eliminate free road service except to regular customers. This means that the person who is only a casual customer or who never has bought anything from the dealer from whom the service is asked will have to pay for it, and pay full value.

Heretofore an owner twenty miles out in the country has had a blowout. He happens to remember that about three or four months previously he had left a tube to be patched at some tire dealer's. He thereupon calls up the dealer, and the dealer sends a car with the tube posthaste to the country. All the dealer gets out of it is perhaps sixty cents for repairing the tube. Now, this owner must pay \$7 for such service. And the tire dealer has figured out that leaves very little profit, when the salary of the chauffeur, wear and tear on the cars, gasoline, etc., are considered.

Of course, no charge will be made on road service to regular customers, the owner who buys his tires and tubes from the dealer. But to the casual, a system of charges based on zones has been prepared.

For the first zone, the charge will be \$2; second zone, \$3; third zone, \$4; fourth zone, \$5; fifth zone, \$7.

The necessity for this action was

pointed out to the dealers by Capt. R. E. Lee, secretary of the association.

One of the tire dealers pointed out that an owner who bought two tires at a department store at a special sale came to the dealers' place to have the tires put on because the store had no service facilities. And for this the tire dealer, who gives the free service, got nothing.

ANOTHER TAX SQUABBLE

Chicago, April 18—Maryland and the District of Columbia have nothing on Hammond, Ind., and Chicago, in the staging of a little squabble over automobile licenses. Strictly speaking, the squabble is between Hammond and South Chicago, but as the latter town is part of corporate Chicago, it will be seen that Hammond has taken on a big opponent.

The whole fight is about city vehicle licenses. Hammond recently passed an ordinance requiring all motor vehicles to take out a city license, similar to the one required of vehicles using city streets required in Chicago. This was all very well until the Hammond police began picking up South Chicago and Chicago motorists who had failed so to equip themselves, believing that a Chicago vehicle license would be sufficient. There was no reciprocity, however, in the city licenses and in retaliation for the action of the Hammond men, the South Chicago police were instructed to arrest all Hammond motorists who did not have Chicago licenses. As a result, motorists who do business in Chicago and Hammond are now obliged to have two license tags.

ALLISON-ROOD IN NEW QUARTERS

Chicago, April 19—The Allison-Rood Co., distributor for the Lincoln car for the Chicago territory, has moved to its permanent headquarters at 2518 Michigan avenue, where it has a four-story sales and service station. The company has formerly occupied a suite of rooms in the McCormick building.

The new salesroom contains 36,000 sq. ft. of floor space. The car salesroom is on the first floor, the general offices and used car salesrooms on the second, while the upper floors are devoted to the service department.

Three Bodies Combine to Combat Gasoline Situation

N. A. C. C., S. A. E. and American Petroleum Delegates Work on Fuel Problems

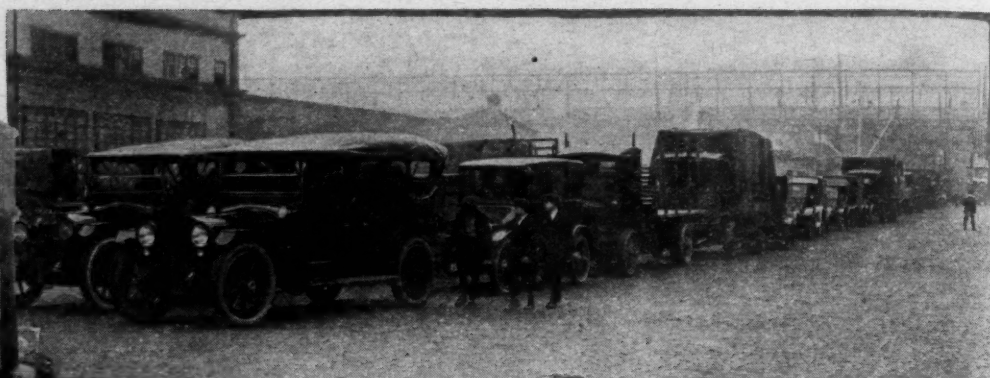
NEW YORK, April 18—A conference preliminary to co-operative efforts, which it is hoped will result in a solution of the gasoline problem, was held last week. Representatives were present from the National Automobile Chamber of Commerce, the Society of Automotive Engineers and the American Petroleum Institute.

Much research work and investigation remain to be done before any conclusions can be reached. The first meeting was given over to a general discussion of the situation from the viewpoints of those who use gasoline and those who produce it. Both interests decried sensational reports that "50-cent gas" is imminent. Such stories have no basis in fact, it was asserted, and the sole result is an incentive to profiteering.

The petroleum men explained that crude oil is the basis upon which prices of gasoline, kerosene and all other by-products are based. One problem is the larger use of crude oil resulting from the steady increase in oil burning machinery.

Representatives of the oil producers disclosed the fact that they are now engaged in research work which they hope will result in the finding of some formula which will give greater power and a greater number of miles of transportation from a gallon of gasoline.

Those who attended the meeting were: W. H. Isom of the Sinclair Refining Co.; R. D. Leonard of the Atlantic Refining Co., and J. L. Smith, secretary of the American Petroleum Institute; Alvan Macauley, president of the Packard Co.; Windsor T. White, president of the White Co.; H. H. Rice, vice-president of General Motors and Alfred Reeves, general manager of the N. A. C. C.; H. L. Horning, Coker Clarkson and Mr. Hill of the S. A. E.



Before New York was visited by the railroad strike, it had a taste of transportation difficulties with a ferry strike. As usual, the motor truck and the automobile were called upon for first aid to the more or less injured and responded valiantly. The above pictures show some of the ways in which the motor vehicles helped out in the crisis.

French Drivers Ship Cars for Indianapolis Speedway Race

PARIS, April 3—Jules Goux and Andre Boillot, European members of the Peugeot racing team, will sail from Havre on April 17 bringing their new mounts with them. The new 183 cu. in. Peugeots have already been on the road and have created a very good impression.

Jean Porporato and Jack E. Scales are shipping their two Porporato cars from Havre on April 24 and will sail from the same port on La France May 1. Porporato has already raced on all the American tracks, his best performance being a second at Chicago. Jack Scales is an Englishman who until quite recently was a member of the Fiat racing team. He was picked to drive a Fiat at Indianapolis in 1917, when the war caused this race to be called off. This is his first appearance in America. He has taken part in numerous European car and motorcycle races and holds world's records in the latter. The Porporato cars, which have been designed by one of the best specialist engineers in France, have been built privately in Paris. The few experts who have seen them pick them out as powerful contenders for the first prize.

In all probability the Ballot racing team will sail from France on May 1. The drivers picked are Jean Chassagne

and Rene Thomas. The third driver is Ralph De Palma. It is possible that Ballot will enter either one or two small cars of only 122 cu. in. It is not expected that either of these will provide the winner, but M. Ballot is certain that they will make a sensational performance. The Ballot 183 cu. in. racers have eight cylinders in line; the baby Ballots have four cylinders.

News from Italy is to the effect that Fiat is working day and night on three racing cars. At the present moment it is not absolutely certain that these can be ready on time. Fiat has gotten out entirely new designs, with engines reputed to run at 5000 r.p.m. Louis Wagner, captain of the team, is on the spot, and if not able to ship his cars in time for the race, he undoubtedly will be the most disappointed man in Europe.

Competition among European racing drivers never was so keen as this year. Andre Boillot, who is the most daredevil driver France has ever produced, put himself into severe training three months ago and has sworn that he will bring the first prize back to Paris. Rene Thomas has not forgotten his defeat in the Targa Florio nor his ill-luck in the last Indianapolis race. Thomas is "The Silent Frenchman," but if anybody ever dares to doubt his ability to pull down

the first prize he gets excited and loquacious. When America went dry Boillot and Thomas did likewise, so as not to feel the effects of the new regime on reaching America. Although the greatest fight is expected between these two, there will be some hard driving from Goux, Chassagne, Porporato and Scales.

Among the Europeans who are expected to come for the race are M. Ballot and his racing engineer Henry; Owen Clegg, chief engineer of the Darracq Co.; Louis Coatalen, of the Sunbeam Co., Charles Faroux, and W. F. Bradley.

TARGA-FLORIO SET FOR SEPT. 5

Paris, March 20—Sunday, Sept. 5 has now been fixed as the date of the Targa-Florio race, on the Island of Sicily. This event, which is one of the oldest established races in Europe, will be reserved to stock cars for the first time. Different classes are provided, according to cylinder area. The winner of the Targa will be the fastest car, irrespective of class, but there will also be a classification according to cylindrical capacity. The race was originally fixed for the month of June, but it is now recognized that European factories cannot be ready by that date.

MARMON DEALERS TO MEET

Indianapolis, April 17—Nordyke & Marmon will hold a convention of all dealers at Indianapolis June 1 and 3. The dealers are to be entertained at the Indianapolis race and will thereafter be shown the new Marmon model which is attracting so much attention in automobile circles throughout the country. Following the dealers' convention will be a meeting of salesmen.

POINT AWARDS AT INDIANAPOLIS

Indianapolis, April 16—Championship points awarded the eighth international 500-mile \$50,000 sweepstakes on the Indianapolis Speedway, in the contest for the 1920 driving championship conducted under the auspices of the American Automobile association, total 2235 points, of which 1000 are for first place.

The Indianapolis race is awarded a much heavier point total than any other racing event on the 1920 calendar, the inaugural contest on the Los Angeles speedway, for instance, having been awarded 1115 points, or less than half

the number, with 500 points for first position.

Winning the driver's championship carries with it the award of a cash prize now being made up by racing enthusiasts throughout the United States, the probable amount of which is figured at \$10,000, so that to breeze home in front at Indianapolis has an additional prime incentive.

H. C. S. STATES BUILDING PLANS

Indianapolis, April 20—The H. C. S. Motors Co. will build its new plant at Fourteenth street and Capitol avenue. It will consist of two buildings, each a four-story structure, with a 60-ft. frontage and 200 ft. in depth. One unit is being rushed to completion. When it is ready to occupy, work will be put on the other unit. The estimated cost is \$500,000.

The H. C. S. Motors Co. is now occupying a part of the Stutz Fire Engine Co. The business of the fire engine company demands all the room at its disposal.

"The new Stutz plant will be modern in every way, with every convenience for employers. At present we are bringing through our first care, but we must have more room for a production of five or ten cars daily. We hope to be in the first unit by July 1," said President H. C. Stutz.

CANADIAN FORD MEN MEET

Winnipeg, Man., April 20—Ford dealers and service men from all over Mani-

Cincinnati Speedway to Go Under the Hammer to Pay Obligations

CINCINNATI, O., April 20—The Cincinnati Speedway at Sharonville, near Cincinnati, will be sold at public auction May 1, by order of Common Pleas Judge Fred L. Hoffman, to clear up its affairs.

The speedway cost \$700,000 and was expected to be a money-maker, but the war hit racing and the place has been

toba and Saskatchewan to the number of 300 met in convention recently in the Fort Garry Hotel.

HOOSIERS TO MOTORIZE FIRE EQUIPMENT

Indianapolis, Ind., April 20—A survey of the Indianapolis fire department has been started by members of the Indianapolis common council, with a view of motorizing all the equipment of the department. It is estimated that it will require from \$450,000 to \$500,000 to equip the city with the additional fire apparatus it needs. The cost of feeding and the increasing difficulty of obtaining horses suitable for fire work is making action along that line imperative. The growth of Indianapolis demands additional fire equipment and it is certain that the city fathers want it all motorized.

going to decay. Liabilities are \$500,000 in stock, \$200,000 in bonds and \$25,000 in loans. The assets are appraised at \$200,000. Since the plant may be sold for two-thirds of the appraised value, or \$133,333.34, the stockholders stand to lose their entire investment, as the sale may not clear enough money to pay the bonds and liens that are outstanding.

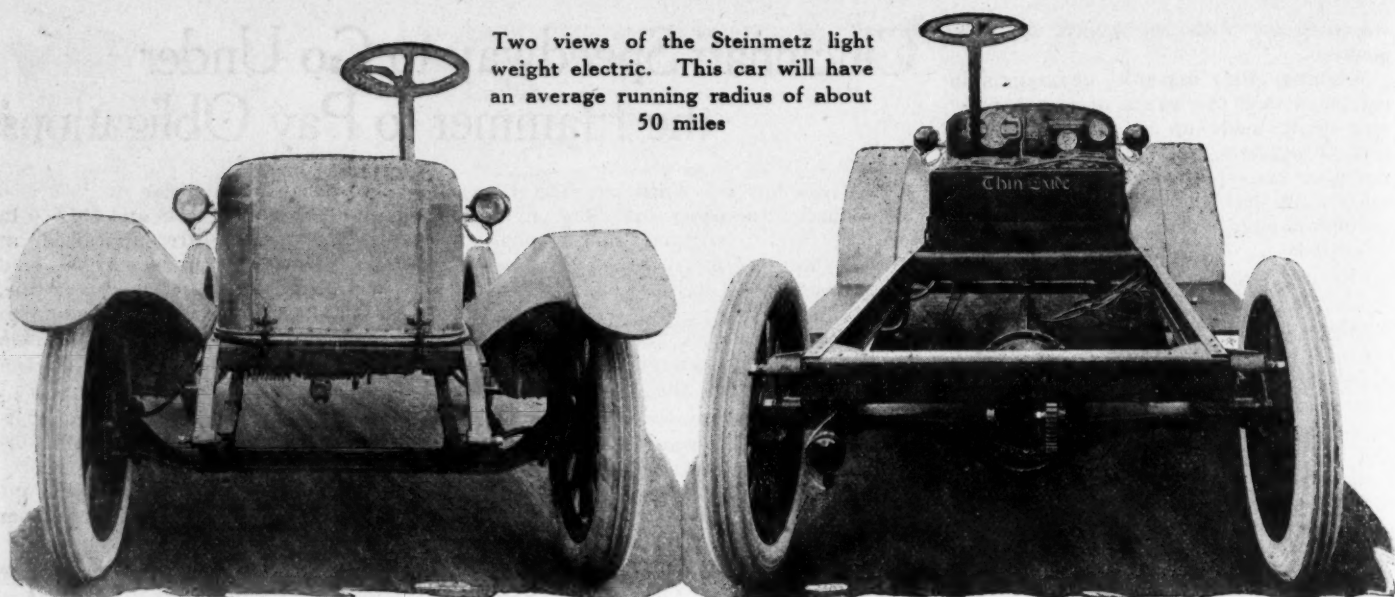
A. J. Roberts, receiver for the company, has called a meeting of stockholders for next week so that he may present to them a plan he has worked out for purchase of the property by them and a reorganization of the company.

The bond-holders, it is reported, may buy the place and hold races there July 4 in an effort to clear their indebtedness, but this has not been definitely decided.

No, gentle reader, this is not a photograph of some of the fashionable Chicagoans who have adopted the fast spreading Overalls for Everyone movement. We had heard so much about the multi-millionaire American mechanic that we thought we'd investigate. We therefore hied our trusty photographer out to get us some pictures of the American Workman in his luxurious moments. As is usually the case with photographers on assignments, he missed out on getting



what we sent him for and brought back something else. So instead of giving you pictures this week of regal luxury, we can present some photographs of mechanics merely going to work,—via taxicabs



Two views of the Steinmetz light weight electric. This car will have an average running radius of about 50 miles

Steinmetz Develops New Electric Truck

Plan to Manufacture Commercial Vehicles Embodying Novel Motor System

MR. Charles P. Steinmetz, chief consulting engineer of the General Electric Co., has developed a new method of motor excitation by which he is enabled to combine the advantages of the series and shunt motor for vehicle propulsion to a certain extent. The system is simplicity itself, for it consists merely in connecting a single storage cell across the field winding of a series wound motor, floating the cell on the line. With the battery voltage and the field winding employed the voltage drop in the field winding at about normal load is equal to the voltage of the field storage cell, and as the two voltages then balance each other, no current will flow through the cell.

At starting and on heavy grades, of course, a current much above normal will flow through the armature, and the current through the field winding will also be increased. But with constant field resistance and an increased current the pressure drop between points A and B will now be greater than the electromotive force of the cell, and a charging current will flow through the cell. Similarly, if the motor current drops below normal, the field cell will discharge through the field coil, tending to maintain the strength of the field.

No matter how the load on the motor may fluctuate, the field strength varies only within relatively narrow limits, the minimum field excitation being that due to the storage cell alone. If the car runs down a grade under the influence of gravity, its speed will increase until the counter electromotive force generated in the motor armature exceeds the electromotive force of the vehicle battery. Then the motor, acting as a generator, will send a charging current through the vehicle battery, thus recuperating some of the extra energy spent in ascending the hill.

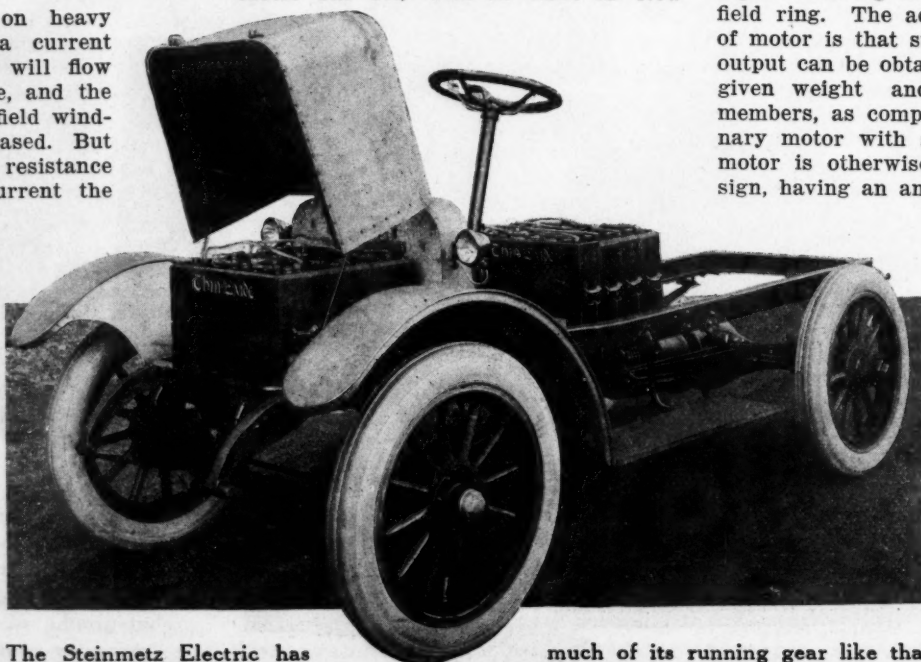
Dr. Steinmetz has organized a company, under the name of the Steinmetz Motor Car Co., with an office in New

York City, which plans to manufacture electric commercial vehicles and industrial trucks embodying the above described motor system and various other novel features.

The experimental work has been done mainly on a $\frac{1}{2}$ -ton delivery truck which was built in Chicago. The chassis with battery but without body weighs about 2300 lb. which is very light, as electric vehicles weights go. It carries a 20-cell 250 ampere-hour lead storage battery of the Exide type and has an average mileage under normal road conditions of 45 to 50 miles.

Steinmetz makes use of a motor having a revolving armature and revolving field ring. The advantage of this type of motor is that substantially twice the output can be obtained from a motor of given weight and absolute speed of members, as compared with the ordinary motor with stationary field. The motor is otherwise of conventional design, having an annular, laminated four polar field frame forming the outside member, and a drum armature forming the inside member.

The commutator is of the regular cylindrical type, but the brushes are counterbalanced to overcome the effect of centrifugal force on them. These are four brushes, at quarters, opposite ones being connected together.



The Steinmetz Electric has much of its running gear like that the average gasoline car. The electric motor drives the axle through a small pinion gear

The motor is arranged with its shaft at right angles to the rear axles. To the forward side of the pressed steel axle housing is bolted a cast-steel housing enclosing the reduction gears. The armature is geared to one axle shaft through a pair of spur gears and a pair of bevel gears, and the field frame to the other. No differential gear is required, as the torque on both field and armature naturally is always the same, and consequently the same driving torque is impressed on the two road wheels.

At the front of the transmission case is the motor, which is supported in bearings in a sort of spider covered with sheet aluminum. The motor housing is spring suspended at its forward end from the frame, and the motor and gear therefore are not absolute dead weight on the axle. There is a partition wall between the gearcase and the motor housing, so the gears can be run in oil without danger of oil getting into the motor and causing trouble there. An-

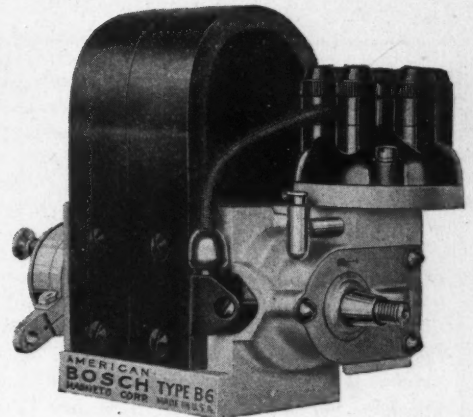
nular ball bearings are used on the shafts.

Speed control is effected by connecting the battery cells either all in series or in two parallel rows, respectively, and by cutting a resistance in and out with each battery combination. Thus four different speeds are obtained as follows:

- 1—Battery in parallel, resistance in.
- 2—Battery in parallel, resistance out.
- 3—Battery in series, resistance in.
- 4—Battery in series, resistance out.

The Steinmetz Motor Car Co. which is negotiating for a plant in Baltimore is planning to go into the manufacture of industrial trucks and light delivery trucks. For the first year an output of 1500 industrial trucks and 500 delivery wagons of 1000 lb. and 2000 lb. is scheduled. Other sizes may be taken on later. The construction will be as nearly standard as possible, only the motor and control being of special design.

Bosch Magneto Radically Changed



The new Bosch magneto is more simple in construction and can be manufactured in large quantities more readily

The new Bosch magneto known as the "B" Type which was shown at the 1920 shows marks the first radical change that has been made in magneto design for many years.

These Type "B" magnetos are claimed to be equal electrically and mechanically to any of the types which have preceded them. They are, however, more simple in construction and because of the saving made in the new and novel method of current distribution can be manufactured more readily in large quantities.

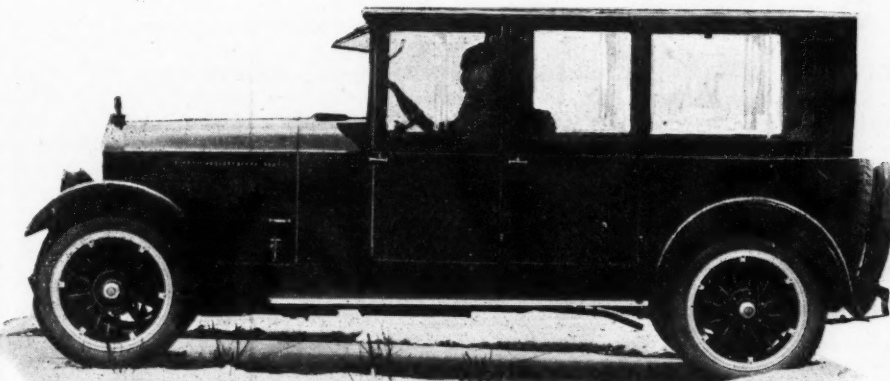
The frame of this magneto is cast of aluminum and includes not only the magneto base, but also the pole shoes and the shaft end plate. The armature and interrupter are of the standard Bosch construction and the armature rotates on ball bearings which are packed in grease making it unnecessary to oil this instrument.

The distributor member is of a new design and is furnished in both the brush and jump spark types—the jump spark being known as Ed. 1 and the brush type being known as Ed. 2. The distributor rotor is driven by two gears which mesh perfectly, one mounted on the armature shaft and the other on the distributor rotor shaft, this design insures absolutely noiseless operation.

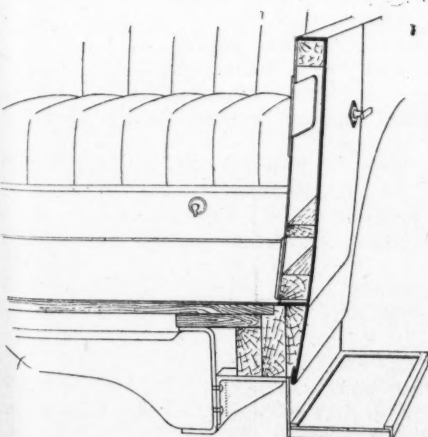
Type "B" magnetos are now being sent into the field with two styles of interrupter housing and timing arms, the first the standard Bosch housing and arm, the second the new style housing and timing arm which consists of a cast arm and band encircling the housing. This housing is perfectly plain, carries no broaching, the band being held tightly in position by a screw which binds its ends together. This screw in turn fastens the ends to the cast arm.

This magneto is also made up in a special form for tractor work and is known as the Type BT4 which is in all respects similar to the Type "B" magneto except that it is provided with the Bosch adjustable impulse coupling enclosed in a dust and waterproof case.

New National Sedan Low Peculiar Construction Brings Running Board Very Close to Ground



National Sextette Sedan recently announced. The space between running board and front fender allows easy access to engine

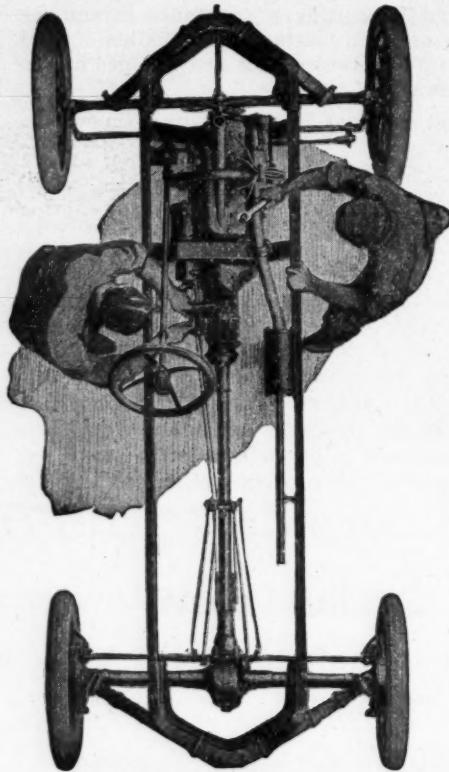


Above is shown the method of construction used in the National Sextette which enables the body to set lower than in the usual practice

An examination of the new National Sedan, recently announced, reveals a car that is surprisingly low, considering the type of car that it is with its 130 in. wheelbase chassis. By the peculiar construction, used in the new National, the running board is brought very close to the ground, and the body is brought within 2 in. of the running board. Another departure from old customs in motor car construction, used in the new National is a running board that continues just beyond the line of the hood and cowl, where it stops. The front fender is of the individual type which provides a space between the running board and the fender allowing easy access to the engine. The sketch shows the method of construction employed in the National Sextette, which enables the body to be placed as low as it is.

SERVICING THE OVERLAND FOUR

THIS is the tenth of a series of articles dealing with the service operations on the Overland Four. The work as it stands has been prepared by the Willys-Overland Co. and the dealer will find at the head of each operation the amount of time required to do the job. The operations have been put down in a step-by-step method so that one operation is logically followed by the next. This makes it possible for the service man to have on hand all the necessary tools and equipment before beginning the job. Incidentally, the time limit set for the job affords a ready means whereby the skill of the mechanic can be judged. Other things being equal it should not take a man longer to do a certain job than herewith mentioned, as the service department of the factory has established these limits after much experimenting. Dealers who are not keeping copies of *MOTOR AGE* on file are suggested to do so to get the benefits of this series.



PART X — The Engine

THESE valuable articles—*Servicing the Overland Four*—will run serially each week until the service operations on the entire car have been explained. This week deals with the

Engine

Next week will be a continuation of the service operations on the engine.

Keep a file of *MOTOR AGE* for ready reference. The flat-rate system of estimating on a job has been proved the best plan to make your service work more profitable, eliminate complaints and please your customers. The time given here for each service operation can be adapted to the flat-rate system of estimating cost of repair jobs on cars of this class.

TO REPLACE CLUTCH SHAFT OR TRANSMISSION FRONT ANNULAR BEARING

Time: 3 hrs., 30 min.

1. Take weight of car off rear springs, using chain falls or crane.
2. Remove cotterpins from rear axle spring bolt nuts.
3. Remove spring bolt nuts.
4. Drive out spring bolts.
5. Remove brake rod from brake pedal by removing cotter and clevis pins.
6. Disconnect hand brake rod from hand brake lever by removing wing adjusting nut.
7. With proper blocking, raise torsion tube and roll out rear system.
8. Remove clamping bolts holding clutch pedal pads to pedals and remove pedal pads.
9. Disconnect speedometer cable at speedometer head.
10. Remove floor boards.
11. Remove clamping bolt holding clutch pedal to clutch shaft and remove pedal.
12. Remove clutch shaft Woodruff key.
13. Pull off brake pedal.
14. Remove nuts and lock washers holding gearshift box to transmission case.
15. Remove gearshift housing.
16. Draw oil from transmission and clutch housing by removing plugs.
17. Disconnect speedometer cable at speedometer drive shaft end.
18. Remove all cap screws holding transmission case to engine base.
19. Remove transmission assembly.
20. Screw in one starting motor cap screw to hold starting motor in position.
21. Remove four cap screws holding universal ball joint retainer to universal joint housing.
22. Remove universal ball joint and retainer.
23. Remove locking wire from the four cap screws holding universal joint rings together, as in Fig. 22.
24. Remove four universal joint ring cap screws.
25. Remove universal joint rear yoke and ring.
26. Remove cotterpin from transmission main shaft nut.
27. Place transmission gear in low speed and remove main transmission shaft nut.
28. Remove universal front yoke and ring.
29. Remove speedometer gear and shaft by unscrewing nut at the top right side of the universal joint, as in Fig. 24.
30. Remove speedometer worm.
31. Remove the three universal joint housing cap screws and one nut and lock washer.
32. Remove universal joint housing.
33. With a soft drift-punch, tapping lightly with hammer, drive out transmission rear bearing.
34. Remove transmission shaft.
35. Remove transmission sliding gears.
36. Remove clutch shifting yoke by removing four $\frac{1}{8}$ -in. cap screws (two on each side) with nuts and lock washers.
37. Drive out clutch shifting yoke.
38. Remove lock wires from four bearing retainer screws at front end of transmission.
39. Remove four bearing retainer screws.
40. Remove transmission front bearing retainer.
41. Drive out clutch shaft and bearing towards front end of transmission by tapping bearing lightly with soft drift-punch and hammer.
42. Remove bearing from shaft and replace on new shaft.
43. See that transmission shaft front bearing, incorporated in clutch shaft or main drive gear is in proper condition and fits correctly on front end of transmission shaft.
44. Place shaft assembly with bearing in transmission housing, locking bearing in position with bearing retainer screws.
45. Lock wire bearing retainer screws.
46. Install clutch fork and bearings.
47. Fasten bearings with four $\frac{1}{8}$ -in. cap screws, lock washers and nuts. Lock securely.
48. Put in transmission main shaft, assembling sliding gears on shaft.
49. Install transmission rear bearing.
50. Install universal joint housing, fastening to transmis-

sion case with four cap screws, lock washers under heads.

51. Install speedometer worm.
52. Install speedometer gear and shaft.
53. Install front universal ring and front universal yoke.

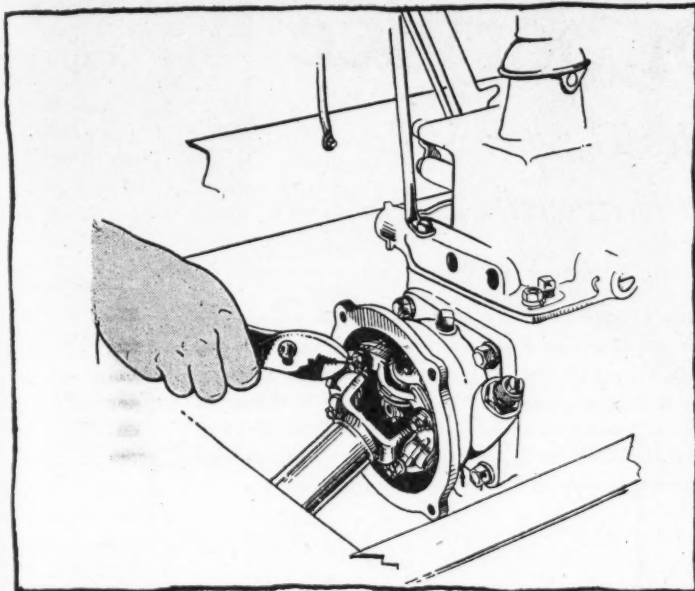


Fig. 22.—Removing universal joint locking wire

54. Place transmission gear in low speed and install transmission main shaft nut.
55. Cotterpin.
56. Assemble universal joint rear yoke and ring clamping rings together with four cap screws.
57. Lock wire universal joint ring cap screws.
58. Install universal ball joint and retainer, fastening to housing with four cap screws, lock washers under heads.
59. Remove cap screw holding starting motor in place.
60. Assemble transmission on blocks under car and place in position.
61. Place clutch shift fork between clutch thrust bearing and clutch plate.
62. Put key in clutch shaft and install clutch pedal.
63. Push clutch pedal forward, which will force transmission assembly in place.
64. Screw in all transmission cap screws holding transmission to engine base.

65. Remove clutch pedal and clutch shaft key.
66. Install brake pedal.
67. Install clutch shaft key.
68. Install clutch pedal, locking to clutch shaft with clamp bolt.
69. Place transmission gears in neutral.
70. Place gearshift lever in neutral.
71. Install gearshift box.
72. Fasten gearshift box to transmission case with lock washers and nuts. Tighten securely.
73. Roll rear system under car—one man under car steering propeller shaft into universal joint.
74. Lower rear of car so that left rear spring bolt can be installed.
75. Install right rear spring bolt.
76. Put on spring bolt nuts, draw tightly and cotterpin.
77. Connect foot brake rod with foot brake pedal with clevis and cotterpin.
78. Connect hand brake rod to hand brake lever with wing adjusting nut.
79. Put in floor boards.
80. Connect speedometer cable to speedometer head.
81. Put in clutch pedal pads, clamping to pedal with clamp bolts, lock washers and nuts.
82. Fill engine base to proper level with good oil.

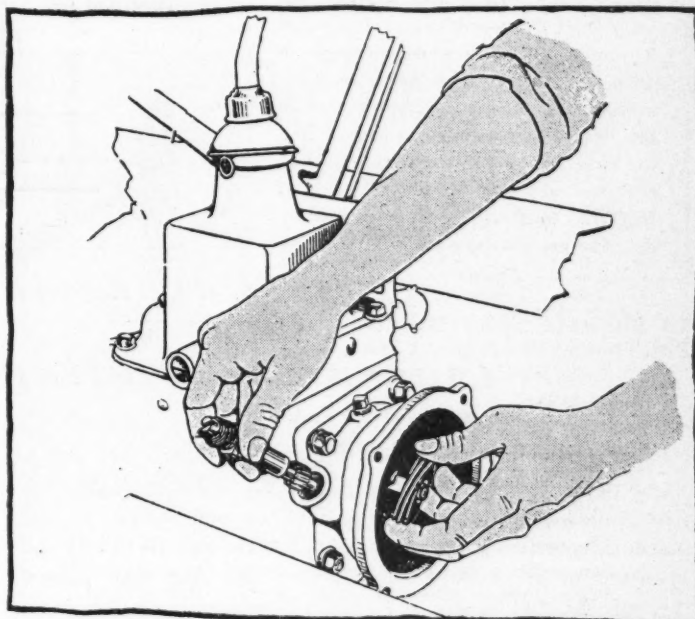


Fig. 24.—Removing speedometer drive shaft gear and worm

Making the Tractor More Comfortable

(Concluded from page 21)

thinking what a fool he was to have bought such an open machine. Then again what chances has a man in Fall to keep hired help when it gets cold. I would like some of those men who demonstrate tractors and tell all the good points, but not the bad ones, sit on one of these open machines all day long in the cold, have the wind blow dirt and dust over him. I have a tractor that has a top but that is all. I enclosed the sides, put a 10 by 12 in. light on each side, got a second-hand windshield put in front, and put a door at back with a window, as the platform was of iron. I covered it with plank and made it larger as iron was too cold on your feet, as the bottom is open in front. I get the heat from the engine, so am nice and comfortable. It is more of a pleasure

to-day to run a tractor than it was before. Now I would like to get a certain make tractor, but as long as they are open I do not think I'll bother with one, as I wish my boy to run it and I am afraid he may drive off and fall, or the spring break and then I would be sorry for it. Now I wish more farmers would take up this, and I believe in a few years the tractors will come out and be as comfortable as a car and a pleasure to run."—Max Brown, Tenney, Minn.

FRIEND MOTORS IN PRODUCTION

Pontiac, Mich., April 18—At a meeting of stockholders of Friend Motors Corp., directors for the ensuing year were elected, and they in turn named officers with Otis Friend as president.

Production of the Olympian car began March 15, and arrangements have been completed for an output of five cars a day beginning April 15, and an increase of ten cars a day within 60 days. Many improvements have been made to the Olympian involving a greatly increased cost, and the list price has been raised to \$1585. A new six-cylinder car to be known as the Friend Six will be manufactured by the company, production of which will begin in the summer.

PURCHASES DELION TIRE BUSINESS

Trenton, N. J., April 18—Walter C. Price and associates of Baltimore have purchased the entire business and good will of the Delion Tire & Rubber Co. of this city. The company has been reorganized with an authorized capital of \$1,500,000 and will erect a modern, up-to-date factory in Baltimore with a capacity of 400 tires per day.

Standard Mechanical Operations in Tractor Service

by John Charles Thorpe, M.E.
and Gustav Howard Radebaugh



EDITOR'S NOTE: The two pages herewith are the twelfth of a series covering the service operations on tractors, although the same can be applied quite generally to passenger car and truck engines. In last week's issue of *MOTOR AGE* we told how to adjust the float valve level. This installment deals with the troubles caused by inaccurate seating of the float valve and how to correct it. It is often the case that the more simple a trouble may be the more difficult it is to locate. It is with this in view that we present this series which deals with the everyday problems that may confront the tractor owner and tell here how to locate and remedy these troubles.

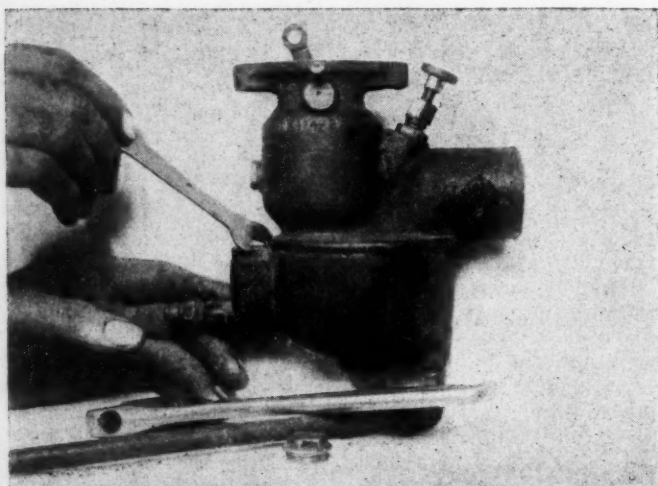
PART XII

Carbureter Troubles

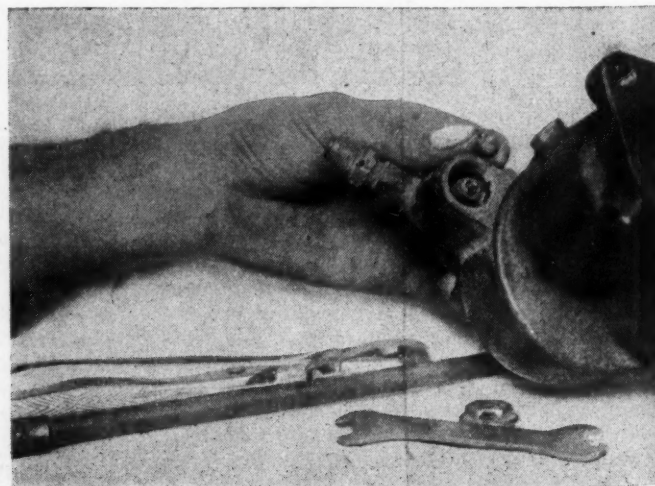
Inaccurate Seating of the Float Valve

Carbureter Troubles. The Float Valve. There are times when the carbureter is flooded and the engine is sluggish from a too plentiful supply of fuel, brought about by the inaccurate seating of the float valve. This may be due to the presence of a particle of scale or rust that has passed through the fuel screen and lodged temporarily on the valve

seat. When this is the case the trouble is easily corrected by removing the cap or plug and lifting the valve from the seat. The rushing of the fuel through the valve will remove the particle. In other instances, the trouble is more serious because of damage to the valve mechanism or the deposit of scale that has taken permanent lodgment on valve or seat.



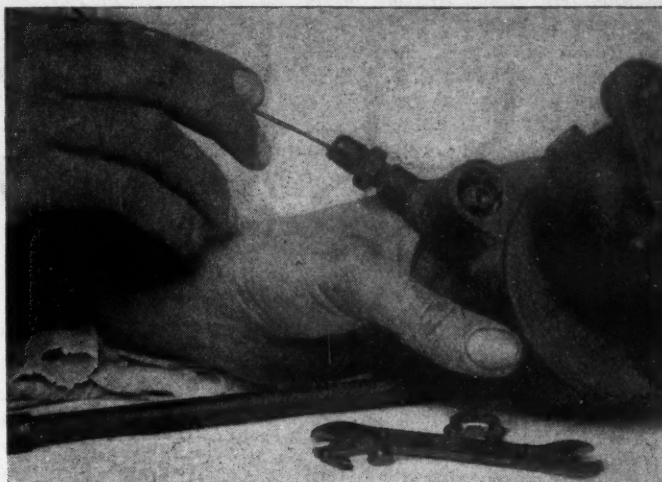
1—After removing cap or plug, remove valve retaining nut with a small open end or socket wrench. The parts are small and the threads fine, so that care is necessary in this operation



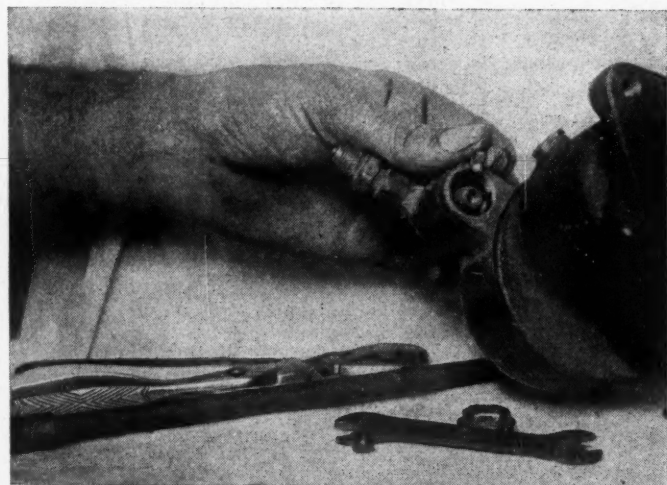
2—This view shows the retaining nut removed. The top of the valve stem may be seen extending above the small yoke on the bell crank lever. Reference should be made to the sectional view of carbureter which ran last week



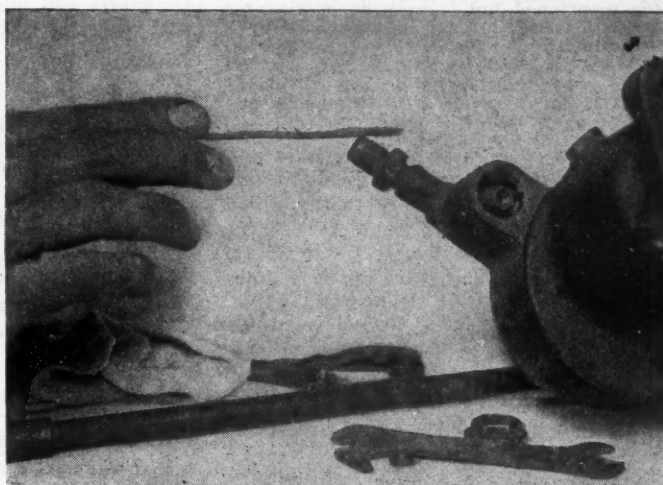
3—Remove the float valve for inspection. This view shows the constructive details clearly. During this procedure the general condition of the float valve assembly should be noted. It is possible that interior parts may be damaged or out of line



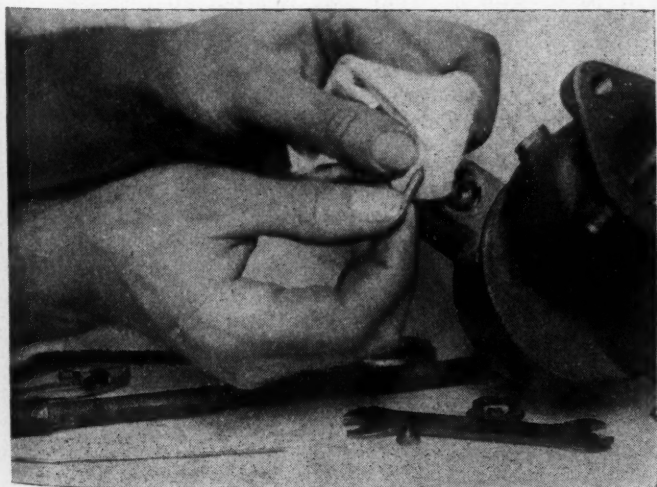
6—It is advisable to insert wire through the supply pipe opening in order to dislodge dirt that may have accumulated below the valve



4—Inspection shows a considerable collection of scale that has adhered so tightly to the conical surface of the valve that it could not be displaced by the flushing action of the fuel



7—This view shows an accumulation of dirt on the cleaning wire. If this were allowed to remain in the carburetor a continual repetition of this operation of reseating the float valve would be necessary



5—The conical tip of the valve may be cleaned by wiping with a dry rag. A little kerosene will help to loosen the scale if it is not readily rubbed off. In bad cases it may be necessary to resort to the use of a fine file as in the case of the repair of the needle valve



8—After the float valve has been reseated and fastened in place with the retaining nut, it is well to blow through the supply opening to remove any loose particles that may remain

Garage Planning

Service Station Arrangements

No. 213

CONDUCTED BY TOM WILDER

STORAGE CAPACITY OF 50 CARS

Will you kindly advise me where I can obtain a book on "Modern Garage Design?" I have a client who is contemplating the erection of a garage with a minimum storage capacity of 50 cars—a display window and show room for two cars and a shop with a capacity of 10 cars.

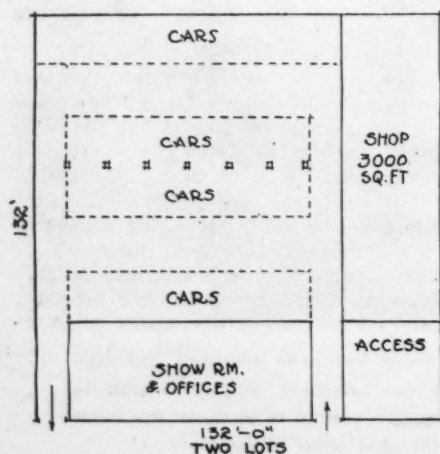
What would be the minimum floor area required for a garage of this car capacity? The average lot in this city is 60 ft. by 132 ft. in size. I have been a reader of "Motor Age" for a number of years but have not kept a file of past numbers.

I realize that a garage of the capacity mentioned could not be built on the lot size mentioned but it may be possible to obtain a larger lot, if not we would have to build two stories in height. Should this be necessary what ceiling heights would you advise to build. Any information you can give me will be greatly appreciated.—Wisconsin Reader.

We know of no book on Modern Garage Design. Your client will need about 7500 sq. ft. of floor space including aisles to store 50 cars. This would be best in the form of 100 ft. width, 75 or 80 ft. deep, two aisles with cars on each side. Or it could be 50 ft. wide and 150 ft. deep. The extra 16 ft. in the width of your lot is more or less waste. If you build two stories you could use part of it for a ramp. The shop to handle 10 cars would need 3000 sq. ft. of floor space.

If you could get another lot making a 132 by 132 ft. square an arrangement something like we show in sketch "A" could be made. If you do not handle sales or accessories a layout on a lot and a half would work out nicely.

Ceilings on the ground floor should be 12 ft. or over, sometimes they are made as low as 10 ft. but circulation of air is poor.



MOTOR AGE is receiving many inquiries for garage plans which do not give sufficient information to permit an intelligent reply. There are certain things which should be known to lay out the proper plan for a garage, and inquiries are urged in asking for such plans to be used to include the following information:

Rough pencil sketch showing size and shape of plot and its relation to streets and alleys.

What departments are to be operated and how large it is expected they will be.

Number of cars on the sales floor.

Number of cars it is expected to garage.

Number of men employed in repair shop.

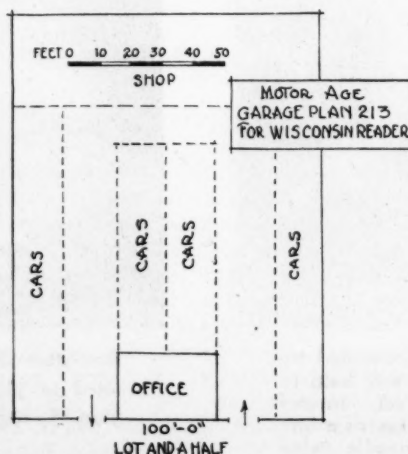
And how much of an accessory department is anticipated.

No. 214

GARAGE WITH NARROW FRONT

Find inclosed a drawing giving size of lot which we have just lately purchased. We would like you to furnish information as to how best to arrange show windows, garage, office and repair parts.—The Martens Hdwe. Co., Lancaster, O.

If you are going to depend entirely on the alley for your car entrance it would be a good plan to have it paved with concrete even at your own expense, then you can keep it clean and free from rubbish just as if it were a part of your garage. Of course if something of this sort is not done the windows along the



No. 213—Storage capacity for 50 cars

alley side of the showroom should be high.

The sills probably 7 or 8 ft. from the floor so that the light would come in but the view would not. The high windows will let in about as much light as windows extending to the floor.

The parts stock room and sales counter has been placed in the garage entrance where it will be handy to the shop as the bulk of this stock will undoubtedly go there rather than to retail customers.

This plan is susceptible to having a second floor build over it in case your business should demand it, but with the high price of building materials it would be advisable to get along with the one story if possible.

No. 215

TWO SALESROOM ARRANGEMENTS

Inclosed please find pencil sketch of a garage 50 by 106, which I am to build. Please lay out a plan for arranging inside of building and also show a suitable front for same of plate glass and brick construction. I have marked it out about the way I would like to have it. I carry a full line of accessories and a good stock of Buick parts, also a full line of Ford parts and about a \$1,000 to \$2,000 stock of tires.

I want enough room in the work shop so I can run three cars head in toward bench at one time. There will be a basement under the shop 21 by 30 for a heating plant, and I intend to do the battery work in basement. I would like the washrack in shop on account of in the winter I would not need to warm up the whole building, as there are very few cars used here during cold weather.

The building will be built of load bearing tile with brick and plate glass front with self-supporting roof. — Herman Lundby, Ostrander, Minn.

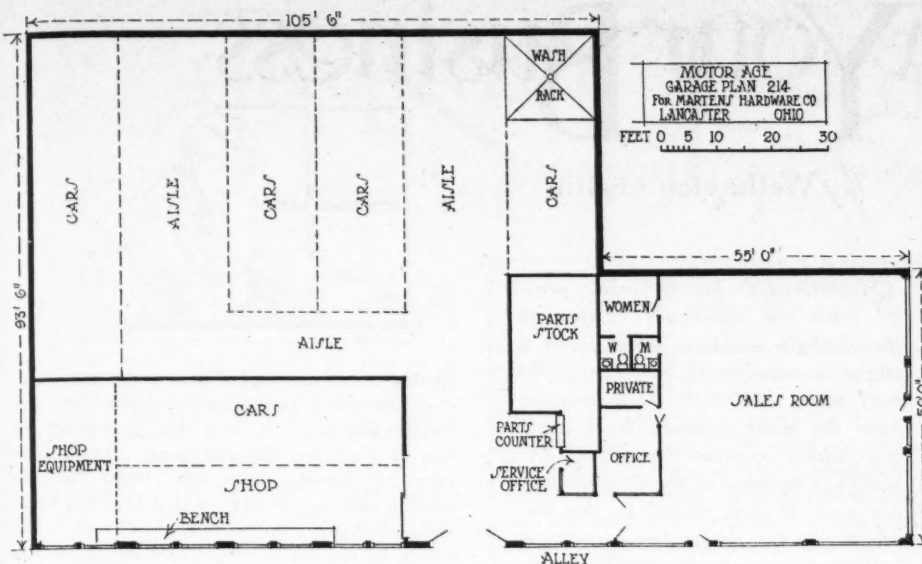
Your plan is about all that could be expected if it suits you. Your proportions are good and things are very well arranged.

If we had followed our own notions, however, we would have combined the two departments at one side, thereby cutting down the attendants to one person, and centralizing your sales activities which is a decided advantage in a general garage of this sort. The accessory display window may be left at the other side to take advantage of the window space as it would be impossible to display cars and accessories in one side.

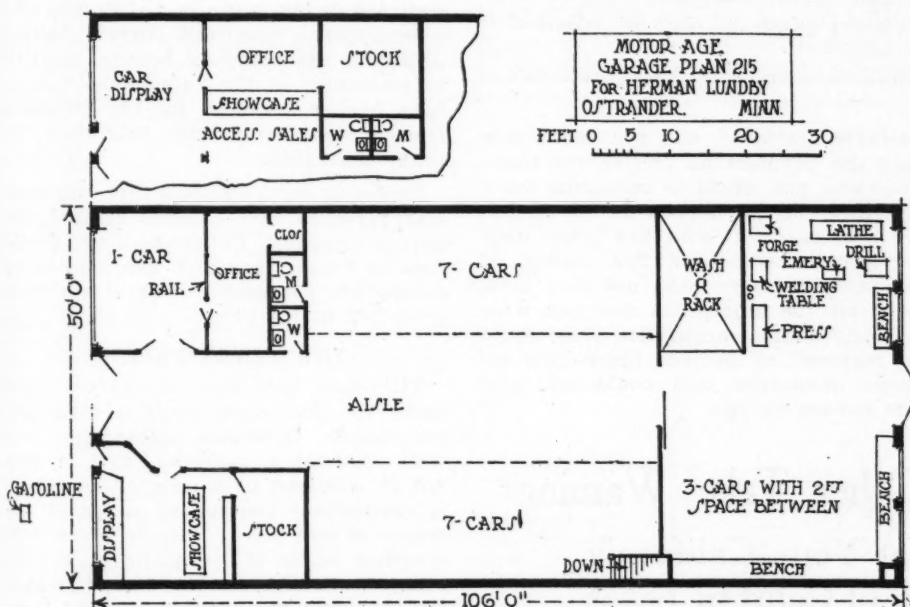
The basement stairway has been moved forward a few feet as it would interfere materially with bench space in the shop, but would not be in the way of cars at all where we have it.

One pit should be enough for the shop for they are used very little and we have noticed that they are a decided nuisance when not in use. We have seen many of them with plank covers which are never removed.

A front for this building is a very



No. 214—Garage with narrow front



No. 215—Two salesroom arrangements

office, and at any time it can be seen how many tires are in stock by looking through this file, this also shows us if any tires have been stolen or lost. When a tire is sold the customer's name and address is put on tag and tag turned in at office, the duplicate tag is taken from file and a record of the sale of tire entered in a book kept for that purpose.

A tag (No. 7) is for the repair parts department, and one of these tags is put on all repairs carried in stock, and when this repair part is sold, this tag is taken into office and another part ordered to replace same.

There is a file for car record cards and every new car, truck or tractor that comes in has a card (No. 8) filled out and placed in file and when the machine is sold, the customer's name and address, the selling price of machine and so on is entered on card and card is kept on file for future reference.

NEW CAR IN LOUISVILLE?

Louisville, April 16—D. Dierenburg, wealthy Chicago auto tire manufacturer, has been in Louisville during the past week looking over a site for an automobile factory. He was here for several days and thoroughly inspected Camp Zachary Taylor. He imparted the news to a friend before returning to Chicago that he would bid on the salvage of the camp when the Government decided to dispose of it. It is understood that it is Mr. Dierenburg's intentions to open an automobile factory in Louisville in the near future and that he is desirous of getting the Camp Zachary Taylor site if he can buy the buildings reasonably and get satisfactory leases on the land. Mr. Dierenburg makes the Fidelity Tire in Chicago.

SHORTER HOURS FOR BATTERY MEN

Hartford, Conn., April 16—Hartford storage battery stations are out for shorter hours and request the public to come around and do business during the new working hours, which are from 8 a. m. to 7 p. m. on week days and from 8 a. m. to 12 m. on Sundays. The battery men figure that they have been working altogether too long each day and if car owners will be a little more considerate they can keep reasonable hours.

CINCINNATI MECHANICS THREATEN STRIKE

Cincinnati, O., April 20—A 25 per cent increase in wages and a 48 hour week will be demanded May 1 by the 2500 motor car mechanics of Cincinnati. In making this announcement, George E. Detzel, business agent of the Cincinnati union, said the minimum pay demanded would be: Journeymen, 80 cents an hour; specialists, 65 cents, and helpers, 55 cents, with time and a half for overtime not exceeding four hours, and double time for time in excess of that and for Sundays and holidays. Employees sent to outside work will receive all expenses.

simple affair. There are hundreds of such fronts with center doors which you must have seen in your trips around. Probably you have an idea of what you want which would not be anything like

what we would make. Take your mason to see a few of the things that appeal to you and he can no doubt build just what you would like best, working in your ideas if you have any hobbies.

Some Good Service Forms and Method of Using

(Continued from page 17)

slips and enters them on a card (No. 3) to be placed in file.

As soon as a car comes into the garage a tag is attached to the car showing what is to be done, and all information is put on this card (No. 4), according to the new state law, which makes it necessary to keep a record of all cars coming in the garage, getting owner's name and address, driver's name and address, etc. This tag is left on the car until car goes out, when tag is brought to office, account settled and car is re-

leased. A repair time card (No. 5) is used on any service work, even if it is a no charge job, the mechanic must fill out this card and turn it in at office.

On each tire or tube that comes in for repairs a tag is put on at the time it comes in, and before work goes out this tag is turned in at office.

When a shipment of tires comes in they are checked with invoice, and tires are tagged (No. 6), the upper part of tag being left on tire, and lower part torn off at perforation and put in file at

Law in Your Business

By Wellington Gustin



NOT LIABLE UNLESS NEGLIGENT

Editor Motor Age—We owned a garage and last fall we had the misfortune of burning out. All of the contents were burned with the building.

There were several storage batteries in the building and also a few cars. Now what we want to know is—can the owners collect for their batteries when they were destroyed in our fire? Several of the losers have been after us about them. —Motor Inn, Finlayson, Minn.

With no other facts than as given, you would not be responsible for the loss of the batteries and cars in the fire. You are not in law an insurer of property left with you for storage or repair. But you are charged with the duty to see that they are not destroyed by fire through your own or your employee's negligence. If you have not been negligent in the matter, your customers cannot collect from you for their loss. They took that risk when they placed the property in your garage.

Now if you had the garage and contents insured, and collected for the destruction of the batteries and cars of others, under your policy, then such funds would belong to the owners of the

SEEMINGLY knotty legal problems are constantly arising in the dealer's business, which even a slight knowledge of the law easily may solve. *MOTOR AGE* presents here the most common legal problems which confront the dealer. Mr. Gustin, a member of the Chicago bar, not only is well versed in the law relating to the dealer but presents it in such a way as to be readily understood by the layman. In addition to his articles, Mr. Gustin will gladly answer such individual inquiries on knotty points as may be submitted him.

property destroyed, and you could only hold the payment as trustee for them. Otherwise you would be collecting for a loss that did not happen as far as you are concerned. If your fire policy does not protect you from fire claims of others, then they could not call upon you from the proposition that you were insured. Without negligence, they would be required to protect themselves by proper insurance, and could not cast that burden on you.

California Dealers and Other Take Warning

A Good Scheme to Beat You—California Law Contravenes Policy of Court in Texas

From Texas comes a case that may point the way for dealers in motor cars, to avoid losses on sales. The selling of cars on a condition, usually reserving title in the dealer until paid for, is so general that every dealer should look up his state law and learn its policy in dealing with conditional sales. To make them effective against third parties, most states require the conditional sales contract to be recorded or filed the same as chattel mortgages. It appears such would be a good policy regardless of the requirement, as is illustrated in the Texas case of Consolidated Garage Company vs. Chambers et al. (219 S. W. 565).

FACTS IN THE CASE

Here the garage company was located in San Jose, Cal., and there sold to one Nichols an automobile for \$1700 under a written contract, providing for the payment of \$600.00 in cash, with title to remain in the garage company until payment of the balance due according to the terms as agreed. Nichols

agreed not to sell or dispose of the car, nor take the same out of the state of California, nor permit it to be removed from his possession, attached, levied upon, nor create any liens against same. Upon performance of all these terms by Nichols the garage was to execute a bill of sale of the car to him. The contract was to be performed wholly within the state of California. But without the knowledge or consent of the company, Nichols removed the automobile to Texas and there sold it to one Chambers. The company located the car at El Paso and brought suit to recover it.

CONDITION SALE NOT REGISTERED—LAW IN CALIFORNIA.

The contract was not filed for record in California, nor in any county in Texas. The car was purchased from Nichols in Texas for a valuable consideration and without notice in defect in Nichols' title. Under the laws of California the contract between the garage and

Nichols was a conditional sale, but title did not pass to Nichols and under the California laws it was not necessary to file or register the contract. There anyone purchasing the car from Nichols would get no better title than he had; the contract, under the laws of that state, being not a mortgage but a conditional sale, the title remaining in the company.

On the trial the court found that the contract, being made in California, was a conditional sale, and Nichols having defaulted the company became entitled to possession of the automobile. Chambers having acquired by his purchase from Nichols no greater title than the latter possessed.

However, on the appeal this judgment was reversed and entered against the garage company. Under the court decisions in Texas, Chambers was held to be a bona fide purchaser for value and thus protected in his title.

THE TEXAS POLICY

The court held that a contract valid under the law where made is valid and enforceable elsewhere, subject to the well established exception that it will not be enforced in a jurisdiction where it contravenes the settled policy of the courts of that place. Now in Texas it is a settled policy of the courts there that enforcement against innocent purchasers for value of secret undisclosed liens upon and reservation of titles to personal property, possession of which has been surrendered, voluntarily, and the possessor clothed with an apparent full title, and unincumbered, shall not be had.

Hence the court held that a conditional sale of an automobile in California, where it was not necessary to register or record the instrument, upon the removal of the car to Texas, by the purchaser, is void as against a bona fide purchaser for value in Texas, unless registered.

In its opinion in the case the Texas court said: "Shall the courts of Texas recognize and extend to citizens of California rights which are denied to its own citizens and which prejudice the interests of innocent citizens of Texas?" The company voluntarily surrendered possession of the car to Nichols, and placed him in a position to perpetuate upon the company the fraud which in fact he did perpetrate. Under the law of

(Continued on page 61)

The Readers' Clearing House

Questions and Answers

CHART FOR ALL RATIOS

Q—I am interested in your chart on engine and car speed which appeared in the November 13 issue. However, as the ratio only runs from 5 to 1 it is of little use to me as I am concerned mostly with trucks. Would it be possible to publish a similar chart with the ratios running from 5 to 15?—John C. Samuels, Colfax Co., South Bend, Ind.

The accompanying alignment chart gives a ready means of using the relation between the diameter of the driving wheels, the gear reduction ratio, the engine speed, and the car speed. It covers a wider range of values than a similar chart published in the issue of Nov. 13, 1919.

To use this chart, pass a straight line through the values of wheel diameter

CONDUCTED BY ROY E. BERG

Technical Editor—Motor Age

and reduction ratio, and where this line cuts the diagonal scale, read the value of the car constant. A straight line passing through this value of the car constant will cut the scales of engine speed and car speed in corresponding values. For a given car, the wheel diameter and reduction ratio are fixed, and the corresponding value of the car constant may be marked on the under side of the diagonal scale, for future use.

In working with a chart of this type, the straight lines connecting various points should not be drawn on the chart, as this would lead eventually to a confusing mass of lines. A better

way is to use a fine thread stretched tight, or a transparent celluloid straight-edge, or, best of all, a strip of transparent celluloid with a line scratched on the under side. This line can be filled with ink or colored pencil, and made very easy to read.

The ranges of values covered by the chart are designed to cover pleasure cars, trucks, and tractors. If, however, values are required beyond the ranges covered, one can readily extend either of the scales indefinitely in either direction, as they are all equal part scales, laid off on straight lines.

MEASURING GEAR RATIO

Q—What is the gear ratio of the Buick C-37? J. I. Bernstein, 374 Park Ave., Youngstown, Ohio.

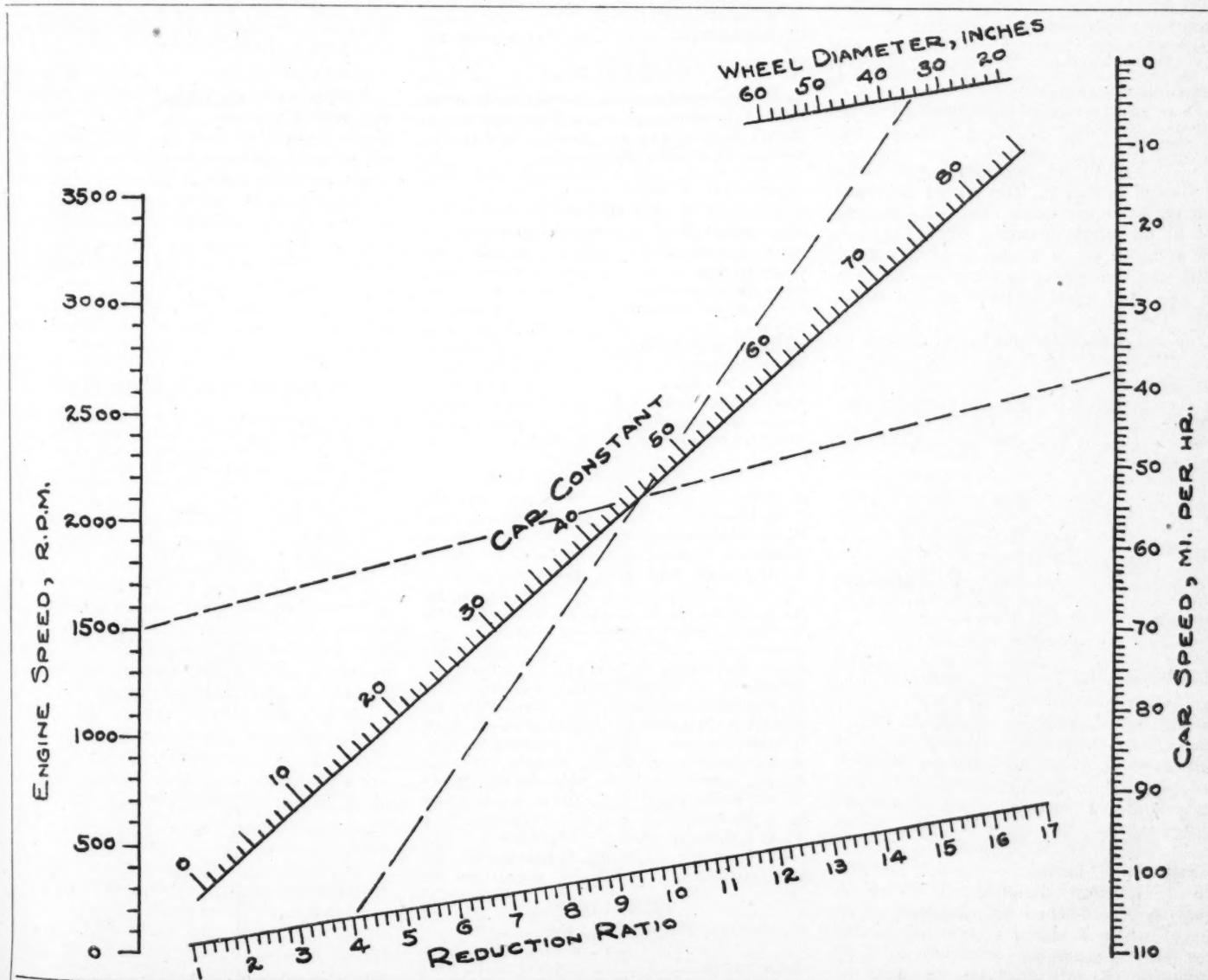


Fig. 1—Chart for speed of cars and trucks for a large range of reduction ratio and wheel size when any two of the three factors engine speed, reduction ratio and car speed are known

On stock models it is 4 to 1 on high. Here is a little way of determining the gear ratio on any car and for any gear and it requires only a few moments to work out the problem. It may come in handy for owners or service men, too.

Place the car on a level floor, cut out the ignition, open the priming cocks or remove the spark plugs to relieve the engine of compression. Use your hand starting crank as if you were about to start the engine. Place the handle, when engaged in the ratchet, in an exactly vertical position. Now make a mark on the tire, with chalk, where the tire is in contact with the floor. Better have some friend watch the rear wheel now. Proceed to turn the engine once, then again and so on until the chalk mark on the tire comes to the floor again, having made one revolution. If you have kept count of the number and fractional times you have turned the starting crank you will know the gear reduction. Of course, it will be necessary to place the gears in mesh, for whatever gear you wish to measure, and leave the clutch engaged during the operation.

CADILLAC TWO-SPEED AXLE

Q—Publish phantom view of the 1914 Cadillac two-speed rear axle and explain its workings.

2—What mileage should be obtained from this car with speedster body, using a Rayfield carburetor?

3—Is the two-speed axle used on present-day models?—Guyan Valley Garage, Logan, W. Va.

1—The Cadillac two-speed rear axle is shown in Fig. 2. The power is transmitted from the drive shaft of the gear set in the usual manner through either set of bevel gears A and B or C and D. With the inner set the ratio is 3.66 to 1 on the high gear, while with the outer sets the ratio is 2.5 to 1. The two large bevel gears B and C are riveted to the differential housing, though one of the pinions A and D that drive them is always loose on the drive shaft. Pinion A is carried by roller bearings, while pinion B revolves on roller bear-

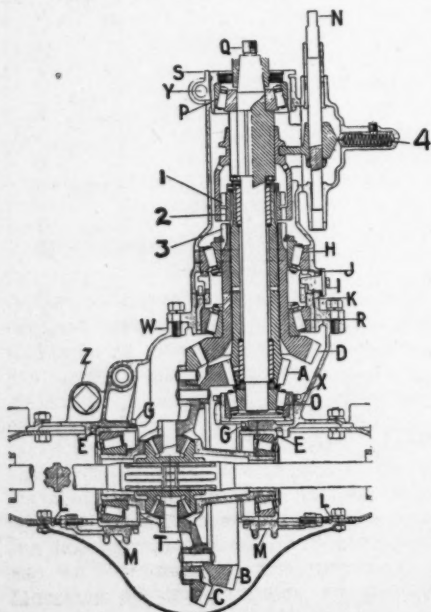


Fig. 2—Two-speed rear axle as employed on 1914 Cadillac

THIS Department is conducted to assist Dealers, Service Stations, Garagemen and their Mechanics in the solution of their repairs and service problems.

In addressing this department readers are requested to give the firm name and address. Also state whether a permanent file of MOTOR AGE is kept, for many times inquiries of an identical nature have been asked by some one else and these are answered by reference to previous issues. MOTOR AGE reserves the right to answer the query by personal letter or through these columns.

To help readers in obtaining as a unit all information on a certain subject MOTOR AGE segregates inquiries in this department into divisions of allied nature. Questions pertaining to engines are answered under that head and so on.

MISCELLANEOUS

John D. Samuels, Colfax Co., South Bend, Ind.
J. I. Bernstein, Youngstown, Ohio
Guyan Valley Garage, Logan, West, Va.
H. I. Ginter, DuBois, Pa.
N. E. Hamilton, Rock River, Wyo.
F. T. Qualman, Milwaukee, Wis.
C. W. Westerby, Chicago
C. E. McAninch, Uniontown, Pa.

CARBURETION

A. C. Hubbell, St. Paul, Minn.
Fred Schuman, Manchester, Ia.
M. W. Betteridge, North Fork, Calif.
Garage and Auto Service Co., Michigan City, Ind.

ENGINES

G. S. Voorhies, Michigan City, Ind.
H. J. Scherbing, Arcadia, Ia.
C. Williams, San Antonio, Tex.
Isabella Garage Co., Toronto, Can.
River Road Garage, Tiffin, Ia.
Reader, Beatrice, Neb.
Edward Burnham, Chicago
Trail Garage, Park City, Mont.
Charles M. Pfaff, Roselle, N. J.
Ben Zimmerman, Flatwillow, Mont.
Reese G. Taylor, Fremont, Neb.
Howell S. Topping, Waincott, L. I., N. Y.

THE ELECTRIC SYSTEM

E. Johnson, Kansas City, Mo.
C. B. Burke, Lethbridge, Alta.
R. E. Hooper, Lincoln, Mont.
Matawan Garage, Matawan, Minn.
R. J. James, The Auto Hospital, Apple River, Ill.
B. A. Liehr, Versailles, Ill.
R. Price, Bliss Vulcanizing Works, Bliss, Idaho
F. G. Stevenson, Afton, La.
Frederick F. Zepp, Vallejo, Calif.
C. F. Hoelscher, Huntsville, Ill.
Daniel E. McCauley, Ironwood, Mich.
Orville Stevens, Alliance, Neb.
R. F. Dickson, Kansas City, Mo.
D. W. Lance, Kingsdown, Kans.
M. W. Betteridge, North Fork, Calif.
H. S. Brown, Newark, N. J.
F. A. Cohlhupp, East End Garage, Brookville, Pa.
Ben Griffith, Evanston, Ill.

REBUILDING

H. Dunlop, Keane's Garage, Steubenville, Ohio
John Smith, Cincinnati, Ohio
Paul A. Heesen, Philadelphia, Pa.
T. A. Baldeme, Baldeme Raynor Garage, Westfield, N. J.
Allen Wood, Geneva, Ohio

ings carried by the casing. A sliding dog clutch member 2 may be employed to clutch either clutch teeth 1 which drive bevel pinion A or clutch teeth 3 which drive bevel pinion D. The sliding clutch is operated by shifting rod N, which is magnetically operated, and which is locked in either position by the spring 4. The S. A. E. horsepower rating of the 1914 two-speed Cadillac is 32.40.

2—This car will give about 11 or 12 miles per gallon. The engine speed of 1400 r.p.m. shows the highest efficiency on the 1914 Cadillac.

3—This type of axle has been discarded and is not used at the present time. With a car speed of 30 m.p.h. using 3.66 to 1 gear the engine speed would be about 1025.28 r.p.m. and with the 2.5 gear the engine speed is 700.28 r.p.m.

HUMMING IN GEAR

Q—Last December I had a high and intermediate slide gear, also new countershaft gearset installed in a 1917 Grant Six, since which time I have had a humming noise in low, second and high. A garageman insists the cause is in the differential which was put in about a year ago. The noise is louder in reverse and low. What is the cause and remedy?—H. I. Ginter, DuBois, Pa.

New gears cannot be made to work smoothly with old gears; that is, where one is new and the other worn. The old gears probably have become worn in spots, whereas the new ones are perfect, and it is quite natural that there should be some friction at the worn spots. The noise may be caused by misalignment, due to worn bearings supporting the pilot and should be remedied immediately, otherwise the bearing gears will gradually become so badly worn that it will mean an entire replacement of gears.

BRISCOE AXLE TROUBLE

Q—Axle trouble on a 1916 Briscoe, 8-38, has caused the breakage of five or six left-hand axle shafts. Would a differential gear using a large axle shaft prevent this trouble?—R. K. Fatchett, Anthon, Ia.

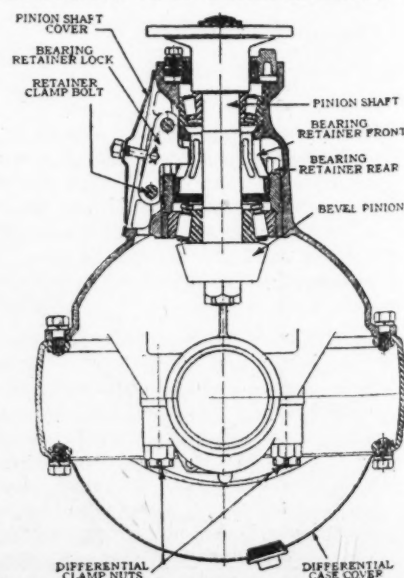


Fig. 3—Vertical cross-section through Studebaker rear axle

From your experience it seems that the axle must be of too light construction for the conditions under which you drive your car. The installation of a larger axle shaft will add a great deal of strength and will probably eliminate the trouble.

GEAR NAMES

Q—What technical name is given to the large drive gear in the differential?

2—What is the name of the gear ring or teeth on flywheel into which the starting engine meshes?—N. E. Hamilton, Rock River, Wyo.

1—This is known as the ring gear and the driving gear is known as the pinion.

2—There is no specific name other than the flywheel gear.

REMOVING OVERLAND WHEEL

Q—Did the Pierce Arrow company ever build a twelve cylinder engine?

2—Instruct how to remove the right rear wheel of a 1915 Overland 83.—F. T. Qualman, Milwaukee, Wis.

1—The Pierce Arrow company has never built a twelve-cylinder engine.

2—Fig. 4 shows the assembly of the Overland rear axle. To remove the rear wheels first take off the hub cap. The axle shafts can be removed by loosening the screws of the rear axle thrust collar until the threaded portion of the shaft may be withdrawn through the collar. After the shafts have been removed the wheel can be taken off with a wheel puller. The brake should be released and if this does not give sufficient room to remove the wheel, the brake rods will have to be disconnected.

STUDEBAKER TRANSMISSION AND DIFFERENTIAL

Q—Instruct and illustrate how to overhaul and take up the main bearings on a 1917 4-cylinder Studebaker.

2—Instruct how to replace worn transmission gears and adjust the pinion gear.—G. W. Westherby, Chicago.

1—First remove the oil pan and the plates at the bottom of the crank case so the main bearings are exposed. Place a jack under the crankshaft near one of the bearings and pry up on it, moving the jack up and down slowly. Watch the oil film and see whether oil is squeezed out by this action. Jack the crankshaft up so it is tight against the upper half of the bearing. Remove the lower bearing cap and remove one of the shims. Then replace the bearing and tighten it. Great care should be taken that the same number of shims are removed from each side of the journal.

2—To adjust the ring and pinion, remove the differential case cover, cleaning the grease from the parts and then loosening the differential clamp nuts shown in Fig. 9. The adjusting nuts can now be moved either in or out, whichever way the bevel gear is to be moved. When one nut is turned the other one is turned in the same distance. This does not affect the tightness of the bearings, but simply moves the whole differential sidewise. To adjust the pinion remove the pinion shaft cover and two retainer clamp bolts, lifting out the bearing retainer lock. With

How Would You Improve Chassis Lubrication?

VERY often the service man finds that it is necessary to perform a good deal of extra work before some particular part can be lubricated. At that moment no doubt he has thought of other methods of lubricating the chassis.

DO you think that a centralized chassis lubricating system" is practical? What is YOUR preference regarding oil cups and grease cups?

YOUR communication is invited.

the aid of a screwdriver or other flat tool, both the front and rear bearing retainers may be moved in the desired direction that the pinion shaft is to be moved. The front bearing retainer is for taking up end play which might develop in the pinion shaft. If they are turned together the end play adjustment will not be disturbed.

To replace worn transmission gears the transmission will have to be entirely disassembled. Place a jack under the drive shaft to relieve the strain and disconnect the front universal joint. Next disconnect the rear universal joint, the gear shift rods and the torque arm. Then disconnect the brake rods, remembering that the transmission must be

properly supported so that it will not drop or shift into a position that will cause any of the parts to bind. Remove the bolts that hold the transmission case to the differential housing and the entire transmission can be removed. Move it to a suitable place and remove the necessary plates so the main and countershafts can be removed. The gears can be taken off of the shaft with an arbor press or a similar device. The assembly will be the reverse of the above described method and great care should be taken to get the gears in correctly and in the right order. The ring gear and pinion will probably have to be adjusted and can be done as directed in question 1. The rear axle and transmission assembly is shown in Fig. 9.

EMPIRE DIFFERENTIAL

Q—Publish a diagram of the 1917 Empire differential.

2—How can I keep the ring gear and pinion properly meshed? I have the second set of gears in the rear end and they are beginning to grind.

3—Would putting small roller bearings next to the ring gear assembly on each side prevent their working apart?—C. E. McAninch, Uniontown, Pa.

1—A diagram of the Weston Mott rear axle used on the 1917 Empire, showing the differential bearing is shown in Fig. 5.

2—The differential assembly has been provided with adjusting sleeves which will enable you to keep the gears in proper mesh and eliminate all unnecessary play. Large driving ring gear is attached to the outside of the case and meshes with the driving pinion. Within the case is a set of four bevel gears, all of which mesh with each other, two of these gears known as the side pinions are mounted on a shaft carried by the case, while the other two gears known as intermediates are attached to the main shafts of the axle. The position of the differential and driving gear with respect to the driving pinion can be adjusted by removing the cover plates on each side of the housing and turning the adjusting sleeves. Both sleeves must be turned the same amount and in the same directions to prevent any end play in the differential bearings.

3—Roller bearings are already provided, and arrangements are made for proper adjustment.

Carburetion

BALL AND BALL CARBURETER ADJUSTMENT

Due to a mistaken identity of carbureter illustrations the request for the illustration and adjustment for the Ball and Ball carbureter as used on a 1918 Oldsmobile was improperly illustrated, in the Feb. 12 issue, with an old type Johnson carbureter. The correct illustration is shown in Fig. 6. The adjustments for this carbureter are all taken care of at the carbureter factory. Fixed nozzles are used which should not be tampered with or changed. As can be seen by referring to the sectional view 1 is the hot air passage of the primary carbureter containing the choke valve 2. Three is the primary ventura

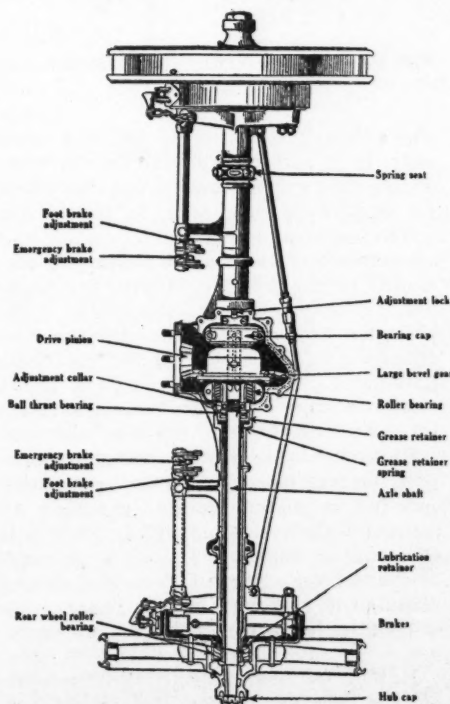


Fig. 4—Full-floating axle as used on a 1915 Overland 83

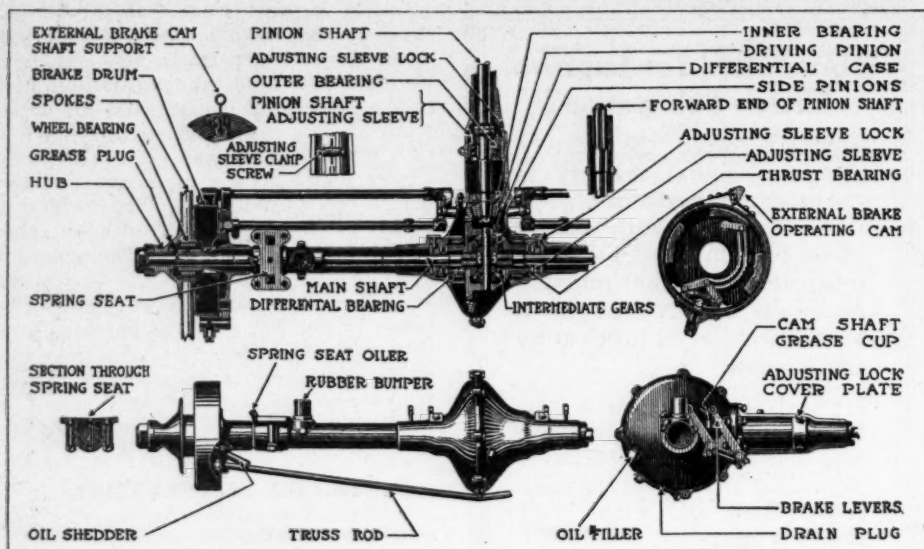


Fig. 5—Weston-Mott axle as used on a 1917 Empire

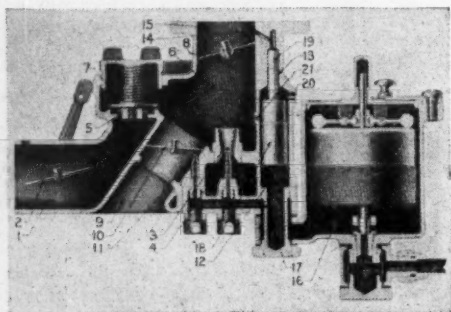


Fig. 6—A cross-section of the Ball and Ball carburetor as used on the 1918 Oldsmobile

throat connecting the hot air passage with the mixing chamber 6, as shown by dotted lines and containing the gasoline jet 4. Five is another fixed air regulating orifice connecting the hot air passage 1 with the mixing chamber 6, and provided with a spring-opposed idling valve 7 arranged to control the air when small quantities only are being used. Eight is a throttle valve of the usual type.

Referring again to the same sectional view, 9 is an air passage leading from the external air to the mixing chamber 6, and it contains the butterfly valve 10, arranged to control the flow of air through this passage. Eleven is a gasoline jet arranged to discharge gasoline into the passage 9, when the valve 10 is opened, causing the gasoline jet 11 to be acted on by the suction of the mixing chamber 6. The air passage 9, with the gasoline jet 11, constitutes the second stage which is brought into action by opening the butterfly valve 10. A connection between the butterfly valve 10 and the throttle valve 8 (not shown) is so arranged that when the throttle valve 8 is nearly wide open, the further opening of this valve throws the valve 10 wide open. At all other times, the valve 10 is held close by a spring (not shown).

It will be seen that under all the usual running conditions of the engine,

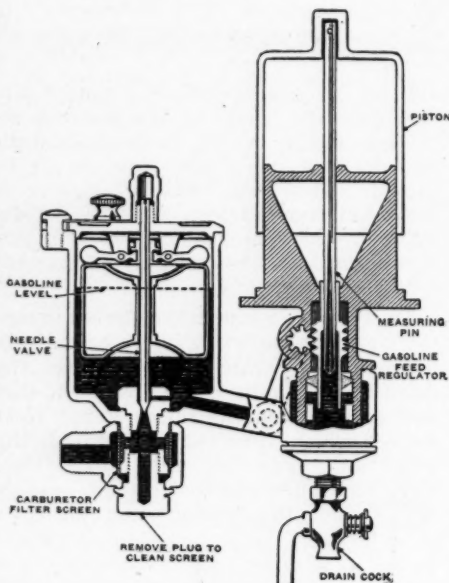


Fig. 7—Cross section of the Hudson carburetor

the primary carburetor, or first stage only, is in service, and the second stage comes into service only when the throttle is thrown wide open to full power.

Twelve is a cylindrical chamber with an extension 13 of reduced diameter connected by the passage 14 with the chamber 15, above the throttle valve. The chamber 12 is connected with the float chamber 16, by means of the restricted passage 17, so that the gasoline at all times in this chamber 12 stands on a level with the level in the float chamber.

Eighteen is a loosely fitting plunger with an extension 19 on its upper end, forming a piston in the chamber 13. An atmospheric opening 20 is located in the wall of chamber 12 and a passage 21 leads from chamber 12 to the mixing chamber 6, through which passage air is constantly drawn in the mixing chamber.

It will be seen that in the operation of the engine, when the throttle is closed, the vacuum of the manifold acting on the piston 19 caused the plunger

18 to rise to its upper position, thus closing the passage to the chamber 15. The space below the plunger 18 is now filled with gasoline from the float chamber and the mechanism is ready for action.

The opening of the throttle 8 breaks the vacuum in chamber 15, and releases the plunger 18, which falls and displaces the gasoline underneath the plunger, causing it to flow into the space above the plunger, where it is quickly discharged through the passage 21 to the mixing chamber, thus augmenting the normal supply of gasoline and causing a rich mixture to momentarily enter the cylinder. This develops a strong pick-up.

HUDSON CARBURETOR ADJUSTMENT

Q—A 1916 Super Six Hudson in the last year has given trouble due to the sooting and misfiring in the end cylinders. This soot is from gasoline and not cylinder oil. Under inlet valves in the intake passage there is often a quantity of gasoline. It is evident that the misfiring is due to improper mixture of air and gasoline. Instruct how to improve carburetion and eliminate the misfiring.—A. C. Hubbell, St. Paul, Minn.

A sectional view of the carburetor used on the Hudson Super Six is shown in Fig. 7. From this you will observe that there are no adjustments on the Hudson carburetor except that for the float level. This is varied by unscrewing the small cap on the top of the float chamber and turning the narrow screw either direction depending upon the level desired. The metering pin adjustment is controlled by the position of the dash control device.

If the float level is noticeably high you are apt to obtain a flooding condition such as described. There might also be the possibility that the metering pin has become bent through an improper setting of the feed regulator lever. Such a condition might cause the pin which is secured to the piston to become inoperative due to a slight misalignment.

STEAM IN CARBURETION

Q—Instruct how to figure piston ring sizes.

2—Do you know of any good machine shop magazine besides "Machinery"?

3—Is there any merit in the Automatic Steam Carburetor Company's device?—Fred Schuman, Manchester, Iowa.

1—A general rule that applies to all motor car engines for the turning of the piston ring is that the outside diameter of the ring blank should be equal to the bore of the cylinder multiplied by the constant 1.035. The inside diameter of the ring blank should be equal to the bore of the cylinder multiplied by 0.973. In splitting the ring enough stock must be taken out so that when the ends of the rings are brought within 1-250 of the bore of each other the new diameter will then be equal to the bore plus the clearance allowance, which is 1.008 times the bore. To secure this then the outer circumference of the ring must be reduced by .085 times the bore. This is the grinding tolerance.

2—The American Machinist, published

by McGraw-Hill Publishing Co., New York City.

2—Reports of certain United States government tests are to the effect that there is no merit in the use of water in connection with the fuel in a gasoline engine; in fact, the reports stated flatly that there is no advantage whatever. Yet, there are facts to dispute this, and one was the experience of the writer some years ago. In that case a sandhole in the cylinder casting permitted water to enter the combustion chamber, and during the night entirely fill. To start the engine it was necessary to open the priming cocks and turn the engine over several times, until the water in the defective cylinder could be cleaned out. When a new cylinder block was installed it was found that three of the old cylinders and their respective pistons were badly carbonized, whereas the one with the leak was as clean as when it was made. But here is another test to bolster up the claim that there is merit in the water theory: This related to the test of what was termed a steam carbureter and the report published in a Chicago daily paper recently was as follows: "It is really an auxiliary carbureter, for it is used in conjunction with gas carbureters. Two Chicago automobile editors yesterday tested this accessory on a Marmon 34, a Velie and a Chevrolet. Carbureters on these machines were, respectively, the Stromberg, Rayfield and Zenith. A quart can was used in one test. On another car the vacuum feed was disconnected from the tank, drained and then filled with exactly a quart of gasoline. The cars were then run on the gas carbureter until the quart was burned up. They were then run using the combined gas and steam carbureters. The following per cent increase in gasoline mileage resulted: Marmon, 33 1/3; Velie, 27, and Chevrolet, 27. The increase in speed under pull was noted as follows: Marmon, 5 1/2 miles; Velie, 5 3/4 miles, and Chevrolet, 6 miles. The water for the steam carbureter is taken from the cooling system, is heated and vaporized by the exhaust manifold. The resultant steam is shot into the gas carbureter to be mixed with vaporized air and gasoline."

FORD CARBURETERS

Q—Would a Stromberg or Miller carbureter give a better running engine in every way on a Ford, which of the two would be preferred regardless of cost.—M. W. Betteridge, North Fork, Cal.

There are many Ford carbureters on the market and all of the manufacturers are making similar claims for their respective products. The selection will therefore have to be left to your judgment.

MILLER RACING CARBURETER

Q—Can a 1 1/2 in. Miller Racing carbureter be fitted and used successfully on an Overland car, model 83?—Garage and Auto Service Co., Michigan City, Ind.

No, for the right size for this car is 1 in. It might be all right to use a 1 1/2 in. carbureter, which will call for special flanges. It would not pay to go to the trouble and expense unless you had in

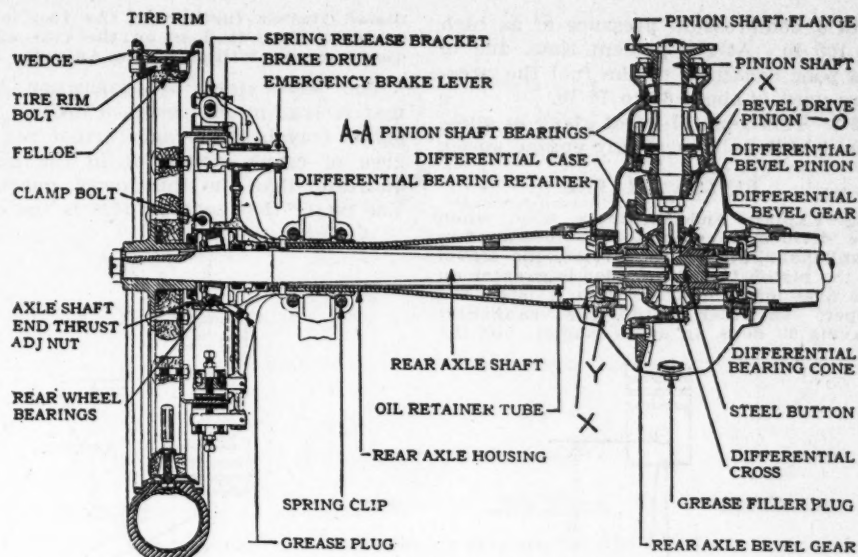
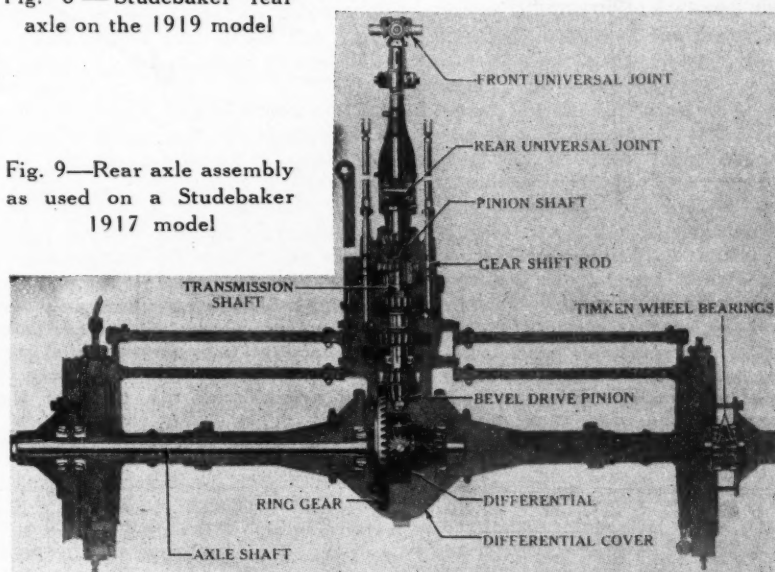


Fig. 8—Studebaker rear axle on the 1919 model

Fig. 9—Rear axle assembly as used on a Studebaker 1917 model



mind doing a lot of work on the car; and this does not often pay on an old model.

PECULIAR KNOCK

Q—There is a peculiar knock in the engine or gearset of a 1915 Detroit, C, which developed after about 1000 miles of driving. I have had the port plugs cut off, as suggested by the factory, put in new ball main bearings, tightened all connecting rods; flywheel is tight, engine tight in frame; in fact, everything seems to be O K, still the knock exists, more so on hard pulls. At times I can go many miles without the knock, then it will develop suddenly and continues under all speeds. Explain cause and state remedy.—G. S. Voorhies, Smithland, Ia.

A knock of this kind is very hard to locate, and it is a difficult matter for us to suggest a remedy. It may be loose camshaft bearings. No casting is absolutely perfect and sometimes the bronze bearings work loose and shift their position inside the casting that holds them. This will result in a very bad knock when the bearing is in a position so that the small side of the ellipse is next to the camshaft. The knock may also be caused by preignition. Oftentimes no knock will be noticeable at slow speeds

when the car is running at a light load, but will be very pronounced when the engine is under a pull or after it has run long enough to get heated up. The knock may only occur in one cylinder and may be a result of scale that has formed in the water jacket. Clean out the cooling system by disconnecting the radiator hose connections and flush the system with water, using a garden hose. Examine the carbureter adjustment to see that you are not getting too rich a mixture and be sure the ignition is working properly. Also see that there is not an excess of oil.

EFFECT OF COMPRESSION

Q—What effect has raising or lowering the compression of an engine?

2—At high speed what would be the effect of raising the compression; and at low speed?

3—At high speed what would be the effect of lowering the compression; and at low speed?—H. J. Scherbing, Arcadia, Iowa.

1—Raising the compression pressure of an engine will increase its power while decreasing the pressure will decrease the power. When the fuel was of high test caliber some engines worked

with a compression pressure of as high as 100 lb. At the present time, due to the poor condition of the fuel the pressure used is about 65 to 70 lb.

2-3—This general effect given in question 1 will be true at any engine speed.

PISTON TRAVEL

Q—Explain and illustrate why, when one divides a complete revolution of a crankshaft into four quarters, the travel of the piston in the cylinder is greater on the first lower quarter than it is on the upper. In other words, the crankshaft travels 90 degs. in each quarter, but the

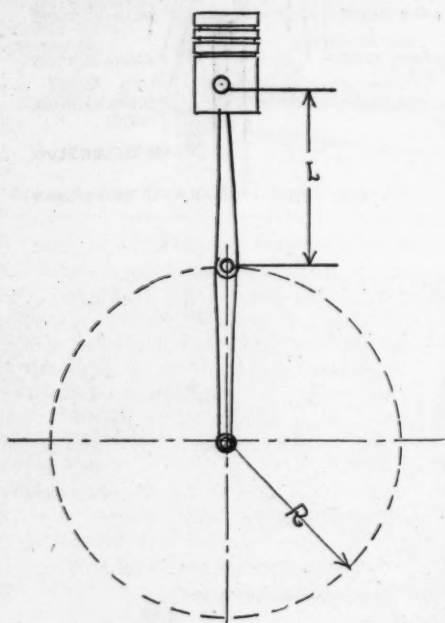


Fig. 10—Diagram illustrating an ambiguous case where the connecting rod length is equal to the crank throw

piston travels further on the two lower quarters than it does on the two upper quarters.—C. Williams, San Antonio, Tex.

You have stated a proposition here that is true in the reversed order. The piston travels faster and further per degree of crank movement in the upper quarters than in the lower quarters. The factor that controls this is the con-

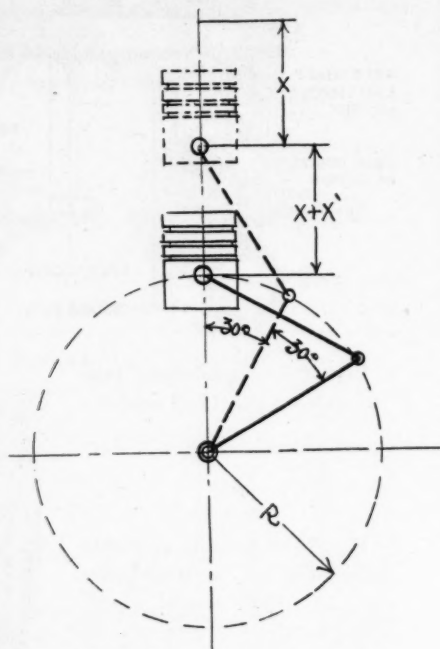


Fig. 12—Diagram showing movement of piston for 30 degrees crank travel with connecting rod length equal to crank throw. The second 30 degrees travel of the crank does not produce the same travel of the piston that the first 30 degrees of the crank travel does

necting rod length. If the rods were of an infinite length there would be no angularity of the rod and the motion of the piston would be a simple harmonic motion which in practice is attained by a system such as shown in Fig. 14. The construction referred to is known as Scottish yoke and is regularly employed on steam fire engines.

To analyze the movement of the piston during different travels of the crank, let us assume that the length of the rod is equal to the crank throw, or in other words that the rod length is equal to one half of the stroke. Such an arrangement is depicted in Fig. 10. Such an arrangement is of course impossible but for purposes of illustration it is interesting to assume that it is possible for theoretical purposes. Now let the crankshaft revolve about 30 deg. The piston will descend the distance X as shown in Fig. 12. Now by revolving the crank 30 deg. more the piston will descend to the new level which is shown in this figure. Now turn the crank 30 deg. more which makes a total movement of 90 deg. in this crank position the piston has descended so that the wrist pin center is in line with the crankshaft center, and the connecting rod center line is in the same plane as the center lines of the two throws for that particular piston. When in this position the next 180 deg. of crank travel produces no movement of the piston. As can be observed by referring to the connecting rod positions 1, 2 and 3. But as soon as the crank travels slightly beyond the 180 deg. mark or a total travel of 270 deg. since the top center position the piston will start to move upward as shown at 4.

Crank Angles in Degrees	CONNECTING ROD TO CRANK RATIO=4		CONNECTING ROD TO CRANK RATIO=4.5		CONNECTING ROD TO CRANK RATIO=5	
	Out	In	Out	In	Out	In
2	.0004	.0002	.0004	.0003	.0004	.0003
4	.0015	.0010	.0015	.0010	.0015	.0010
6	.0034	.0021	.0033	.0021	.0033	.0022
8	.0061	.0046	.0060	.0038	.0058	.0039
10	.0095	.0077	.0092	.0059	.0091	.0061
12	.0136	.0102	.0133	.0087	.0131	.0088
14	.0185	.0141	.0181	.0116	.0178	.0119
16	.0241	.0196	.0236	.0152	.0232	.0156
18	.0304	.0258	.0298	.0192	.0293	.0197
20	.0375	.0328	.0367	.0237	.0360	.0243
22	.0452	.0402	.0442	.0286	.0434	.0294
24	.0536	.0479	.0524	.0340	.0515	.0349
26	.0627	.0563	.0613	.0399	.0602	.0410
28	.0724	.0652	.0708	.0462	.0696	.0475
30	.0827	.0753	.0809	.0531	.0796	.0545
32	.0936	.0863	.0916	.0603	.0901	.0619
34	.1051	.0980	.1029	.0680	.1012	.0698
36	.1172	.0738	.1147	.0762	.1128	.0782
38	.1298	.0822	.1271	.0848	.1250	.0870
40	.1430	.0910	.1400	.0939	.1377	.0962
42	.1565	.1002	.1534	.1034	.1509	.1059
44	.1707	.1099	.1673	.1134	.1646	.1161
46	.1853	.1201	.1816	.1237	.1787	.1267
48	.2003	.1306	.1963	.1345	.1932	.1377
50	.2156	.1416	.2115	.1458	.2081	.1491
52	.2314	.1530	.2270	.1574	.2234	.1609
54	.2474	.1648	.2428	.1695	.2391	.1732
56	.2638	.1769	.2589	.1819	.2550	.1858
58	.2805	.1896	.2754	.1947	.2713	.1988
60	.2974	.2026	.2920	.2079	.2878	.2122
62	.3146	.2159	.3090	.2215	.3046	.2260
64	.3320	.2297	.3262	.2355	.3215	.2401
66	.3495	.2438	.3435	.2498	.3387	.2545
68	.3672	.2582	.3610	.2644	.3561	.2693
70	.3850	.2730	.3786	.2794	.3735	.2844
72	.4028	.2881	.3963	.2947	.3911	.2998
74	.4208	.3036	.4141	.3103	.4088	.3155
76	.4388	.3193	.4319	.3261	.4266	.3315
78	.4568	.3353	.4498	.3422	.4444	.3477
80	.4747	.3516	.4677	.3586	.4622	.3642
82	.4927	.3682	.4857	.3753	.4799	.3809
84	.5105	.3849	.5034	.3921	.4977	.3978
86	.5283	.4019	.5211	.4091	.5154	.4149
88	.5460	.4191	.5388	.4263	.5330	.4321
90	.5635	.4365	.5563	.4437	.5505	.4495

Fig. 11—Table showing movements of piston for every 2 degree revolution of the crankshaft for different ratios rod to crank throw lengths. A ratio of 4 to 1 means that the connecting rod is four times as long as the throw of the crank or equal to two times the stroke. It will be seen from this a piston moves faster in the upper quarters than it does in the lower quarters of revolution

Crank Angles in Degrees	CONNECTING ROD TO CRANK RATIO=4		CONNECTING ROD TO CRANK RATIO=4.5		CONNECTING ROD TO CRANK RATIO=5	
	Out	In	Out	In	Out	In
92	.5802	.4540	.5737	.4612	.5670	.4670
94	.5981	.4787	.5909	.4789	.5851	.4846
96	.6151	.4895	.6079	.4966	.6022	.5028
98	.6318	.5073	.6247	.5143	.6191	.5201
100	.6484	.5253	.6414	.5323	.6358	.5378
102	.6647	.5432	.6578	.5502	.6523	.5556
104	.6807	.5612	.6739	.5681	.6685	.5734
106	.6964	.5792	.6897	.5859	.6845	.5912
108	.7119	.5972	.7053	.6037	.7002	.6082
110	.7270	.6150	.7206	.6214	.7156	.6265
112	.7418	.6328	.7356	.6390	.7307	.6439
114	.7562	.6505	.7502	.6565	.7455	.6613
116	.7703	.6680	.7645	.6738	.7599	.6785
118	.7841	.6854	.7785	.6910	.7740	.6954
120	.7974	.7026	.7921	.7080	.7878	.7122
122	.8104	.7195	.8053	.7246	.8012	.7287
124	.8230	.7362	.8181	.7411	.8142	.7450
126	.8352	.7526	.8305	.7572	.8268	.7609
128	.8470	.7686	.8426	.7730	.8391	.7766
130	.8584	.7844	.8542	.7885	.8509	.7919
132	.8694	.7997	.8655	.8037	.8623	.8068
134	.8799	.8147	.8763	.8184	.8733	.8213
136	.8901	.8293	.8866	.8327	.8839	.8354
138	.8998	.8434	.8966	.8466	.8941	.8491
140	.9090	.8570	.9061	.8600	.9038	.8623
142	.9178	.8702	.9152	.8729	.9130	.8750
144	.9262	.8828	.9238	.8853	.9218	.8872
146	.9342	.8949	.9320	.8971	.9302	.8988
148	.9417	.9064	.9397	.9084	.9381	.9099
150	.9487	.9173	.9469	.9191	.9455	.9204
152	.9553	.9276	.9538	.9292	.9525	.9304
154	.9617	.9373	.9601	.9387	.9590	.9398
156	.9671	.9464	.9660	.9476	.9651	.9485
158	.9724	.9548	.9714	.9558	.9706	.9566
160	.9772	.9625	.9763	.9633	.9757	.9640
162	.9815	.9696	.9806	.9702	.9803	.9707
164	.9854	.9759	.9848	.9764	.9844	.9767
166	.9888	.9815	.9884	.9819	.9881	.9822
168	.9918	.9864	.9913	.9867	.9912	.9869
170	.9943	.9905	.9941	.9908	.9939	.9909
172	.9963	.9939	.9962	.9940	.9961	.9942
174	.9979	.9966	.9979	.9967	.9978	.9967
176	.9990	.9985	.9990	.9985	.9990	.9985
178	.9998	.9996	.9997	.9996	.9997	.9996
180	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

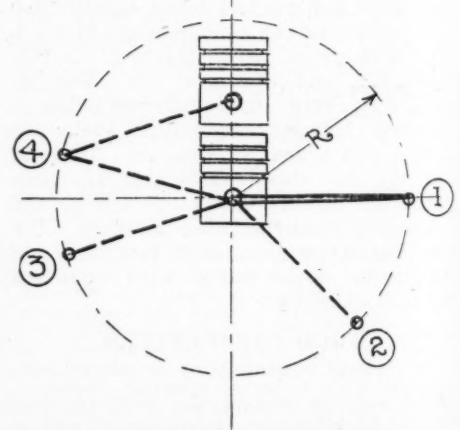


Fig. 13—When the crank reaches the position 1 the piston has descended to the center line of the crankshaft where it remains for the next 180 degrees of the crank travel

The tabulated values of crank angles in degrees and crank movements in out and in positions, that is, the designation "out" denotes that the stroke is toward the crankshaft and "in" denotes that the stroke is away from the crankshaft, is shown in Fig. 11.

WANTS MORE COMPRESSION

Q—I want to raise the efficiency of a Studebaker Big Six, and believe the best way to do so would be to raise the compression from 60 to 90 pounds. How much should be machined off the cylinder block

base to accomplish this end without taking undue risks?

2—What alteration, if any, in the timing of the intake and exhaust valves?

3—Could the valves and valve ports be increased to 2 inches?

4—Would the crankshaft bearings, connecting rod bearings, and crankshaft stand up to work under the changed conditions, and would the present radiator have sufficient capacity to keep this engine cool with 90 lbs. compression?

5—Why are shock absorbers fitted to the rear end of the rear springs, on to the front end of the front springs, but are not fitted to the rear end of the front springs and the fore end of the rear springs? It would appear that the one is just as necessary as the other.—Isabella Garage Co., Toronto, Can.

1—This supposition is entirely wrong. A few years ago when the fuel was much better than it is now, engines were designed to have a compression pressure of about 90 to 100 lb. At the present time the automobile engines are working with a compression pressure of about 65 to 75 lb. It is true that raising the compression increases power, but you will find that if you raise the pressure to 90 lb. at the present time the engine will have a very heavy fuel knock and it will be very hard to start. There is but one thing to do that might aid in increasing the efficiency of the engine, and that is to get as near perfect carburetion as possible and see that the ignition is

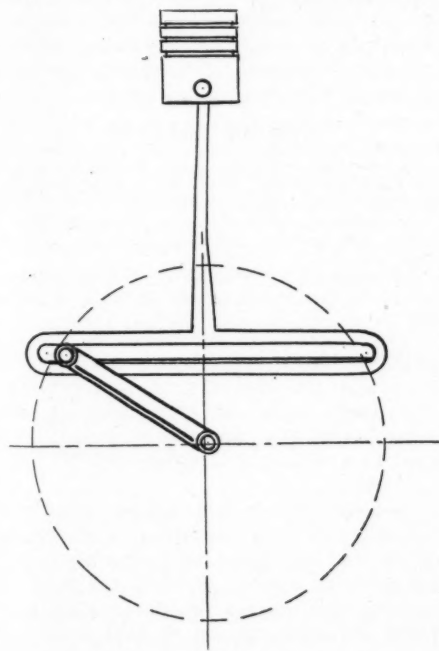


Fig. 14—This shows a connecting rod of the slotted end type which produces a simple harmonic motion. The piston moves as much in the lower quarter as it does in the upper quarter

functioning so as to ignite all of the charge.

2—If the timing is changed so as to advance one tooth it will give better running at high speeds, but will not work good at low speeds. For average running conditions the valves have been timed by the Studebaker engineers at what they consider the most efficient timing.

3—The valve ports can be increased to 2 in. and this will increase the volum-

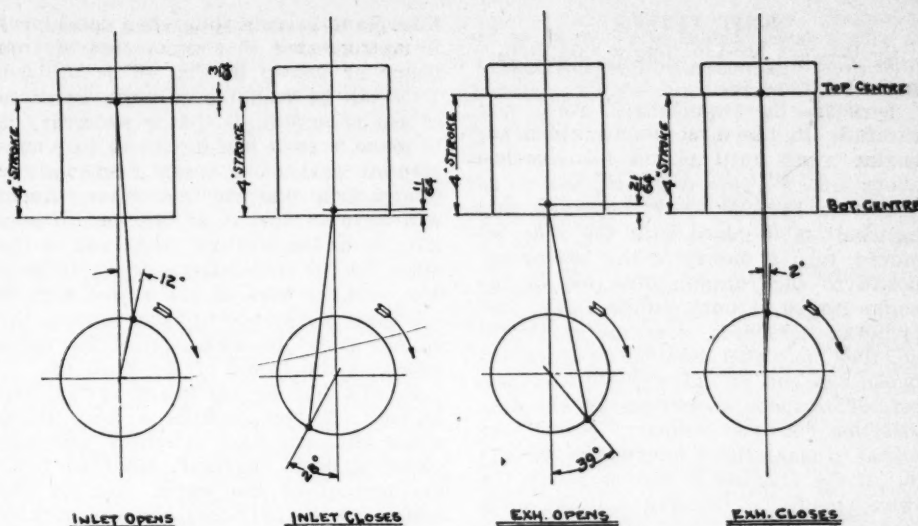


Fig. 15—Valve timing diagram for 1915 Krit

etric efficiency. However, nothing will be gained because this will increase the fuel consumption and offset the advantage gained by the increase in size of the valve ports.

4—To make all the changes you suggest would mean that the design of the engine would be altered a great deal. Working at a compression pressure of 90 lb. will create a big increase in heat and the present system of cooling will not be adequate to handle the changed conditions. This high compression will also cause excessive strain on the bearings as they are designed to handle conditions at low pressure.

5—The design of the car is the influencing factor that governs the location of the shock absorber. The logical place for shock absorbers on the front spring is at the front end, because of the fact that the front end is solid, while the rear end is shackled with a swivel. In cars using semi-elliptic springs and Hotchkiss drive the rear ends of the rear springs are shackled with a swivel. In cars using a torque tube it is possible to use certain types of shock absorbers at the rear end of the rear spring. However, we have in mind two shock absorbers that are attached at the center of the springs, the Hartford and the Houdaille.

HEIDER ENGINE KNOCK

Q—When pulling hard there is an engine knock in our Heider 12-12 tractor. What is the cause and how can it be remedied?—River Road Garage, Tiffin, Ia.

This is probably a bearing knock, or, if the engine heats up too much it may be a preignition knock. Look over the bearings carefully, clean out the carbon and grind the valve. It would be well to go over the cooling system and see that any scale that might have formed is not preventing the proper circulation of the water.

VALVE TIMING

Q—Give the theory or explanation of why the inlet should open at about 10 deg. and exhaust 135 deg.—Reader, Beatrice, Neb.

1—The valves are operated by cams on the shaft, which turns at one half

speed of the crankshaft so that each valve is opened and closed once during two revolutions of the crankshaft. When the engine is to operate at very low speed, the inlet valve should begin to open and should close at the beginning and end of the inlet stroke respectively, and the exhaust valve should open a trifle before the end of the power stroke and close at the end of the exhaust stroke. In order to have an engine run satisfactory at high speed the valve periods are altered considerably. The exhaust valve must open earlier and close later and the inlet valve must open later in order not to overlap the exhaust opening and close later. Most engines today are high speed. If an engine is timed to give the very best output at high speeds it will not run so satisfactorily at low speeds and will not be as flexible. This is due to the fact that when the exhaust opens very early some of the power otherwise available at low speed, is lost through the exhaust and when the inlet valve closes very late some of the charge drawn in through the suction stroke will be forced out again during the beginning of the compression stroke. The cylinder will not receive a full charge and will not utilize to the best advantage the charge it has received. The valve timing has an effect on fuel economy and power output which is about the same; that is the amount of fuel consumed per horsepower hour decreases as the inlet valve is closed later, up to a lag of 60 degrees, but increases for a lag of 90 degrees. The angular speed corresponding to the maximum power is greater the later the inlet valve closes. The reason the inlet valve has to close sometime after the completion of the inlet is that at high speed the inrushing column of gas possesses considerable inertia and the charge continues to flow in the cylinder even after the piston has started on the return or compression stroke. The above statements on the influence of inlet valve timing on power and fuel efficiency were obtained from a test conducted at the laboratory of the Automobile Club of France on a 4-cylinder Renault engine.

KRIT TIMING

Q—Instruct how to time a 1915 Krit.
2—Give the firing order.—Edward Burnham, Chicago.

1—Turn the crankshaft over very carefully in the direction in which the engine runs until piston has reached about 3-64 in. past top dead center, as shown in Fig. 15. Now assuming that camshaft is in place with the gear removed, turn it slowly to the left or opposite to the running direction of the engine; turn it until either valve, first cylinder, is closed, or as far as it will go, then note the distance or space between the end of valve stem and tappet. This space should permit the easy insertion of an ordinary postal card folded to make three thicknesses, or .029 in. If the distance is less than this the valve should be removed and the stem filed, or if engine is one with adjustable tappets, this distance can be set by turning adjusting screw up or down until the correct clearance is obtained. With the clearance properly adjusted and the piston in the position mentioned, the camshaft should be turned to the position where the intake valve on No. 1 cylinder just begins to open. The gears can then be slipped in place.

2—The firing order is 1-3-4-2.

STATIONARY ENGINE MOUNTING

Q—Publish diagram illustrating way to mount a Ford engine so as to use it as a stationary engine.—Trail Garage, Park City, Montana.

Inasmuch as you probably will use

this plant to run your shop machinery it is suggested that some sort of iron frame as shown in Fig. 20 be utilized. This can be made to suit the purposes of any shop and all that is necessary is to make it so it can be bolted to a substantial part of a heavy floor and be braced from one end to another. Room will have to be left at one end to permit use of the starting crank and at the other for the transmission to be utilized. The parallel bars of the frame can be set apart a distance to accommodate the engine arms; in other words, the same width as the frame of the Ford car.

It will not be necessary to use the radiator if you provide a very large water tank and have generous inlet and outlet pipes to the tank, the inlet from the bottom of the water tank to the bottom of the cylinders and the outflow to the top of the water tank. A small gasoline tank can be arranged at any convenient place, likewise the coil and throttle levers. The size of the drive pulley must be determined by the speed at which you turn the engine and the load to be carried.

CAMSHAFT GRINDING

Q—In remodeling a K-45 Buick into a speedster the camshaft has been changed to quiet the valves. Would grinding the cams give a quicker valve action, and what is the proper method of grinding?

2—Would a Miller carbureter and aluminum pistons work better and what size of carbureter should be used?

3—Approximately, what speed would this car attain?—Charles M. Pfaff, Roselle, N. J.

1—If any changes are to be made in the camshaft grinding we first wish to advise that work should not be attempted by those who are not familiar with accurate machine work, and the methods necessary to obtain machine accuracy to 0.0005 in. The portion of the cam to be ground is the radial portion. No more than 3/32 in. material should be removed. At the position where the radial portion meets with the tangen-

tial surface of the cam the grinding should be stopped. A universal grinding machine with a backing off attachment is very suitable for this kind of work.

2—If you are to use a Miller carbureter we suggest that you use a slightly larger size than that now used on the car. A 1½ in. size will be suitable. Regarding the use of aluminum pistons we feel that the engine speed will be increased slightly as will the power. The greatest factor that controls engine speed is valve size, and should you desire to greatly increase the engine speed larger valves should be installed.

3—By changing the rear axle rates to about 3 to 1 a speed of something like 75 to 80 m.p.h. should easily be attained.

LOOSE CONNECTING RODS

Q—Explain why the connecting rods in a 1917 Ford become loose in about 150 miles; five bearings have been burned out in the past two months. The oil pipe has been cleaned and have changed oils. Do you advise drilling a hole in the top of the bearing to admit oil and cut oil grooves in the bearing?

1—The fact that the bearings burn out and the connecting rods loosen up so quickly indicates that the crankshaft is out of round or the rods are not lined up square with the crankshaft. The trouble may be due partly to poor babbitt in the bearings. If the lubricating system is working properly and the rods are lined up correctly the bearings should receive sufficient lubrication without changing the bearing structure.

KNIGHT ENGINES

Q—Is the exhaust on a Knight engine as loud or louder than on a poppet-valve engine of the same size?

2—Is the noise of the explosion somewhat silenced by the action of the valves and how?

3—Some makers claim carbon is a benefit to a Knight engine; is this true?—Reese G. Taylor, Fremont, Nebr.

The intensity of the sound of the exhaust of the poppet valve type of engine and the sleeve type is the same. The valve noise is eliminated in the sleeve valve type and the gases are handled in a different manner.

2—See 1.

3—A limited carbon deposit does two things: First, it increases to a limited extent the compression by reducing the compression space. Second, the coat of carbon acts as an insulator and prevents the transmission of heat from the piston and cylinder head, which heat, instead of wasting through these walls into the cooling water or base cham-

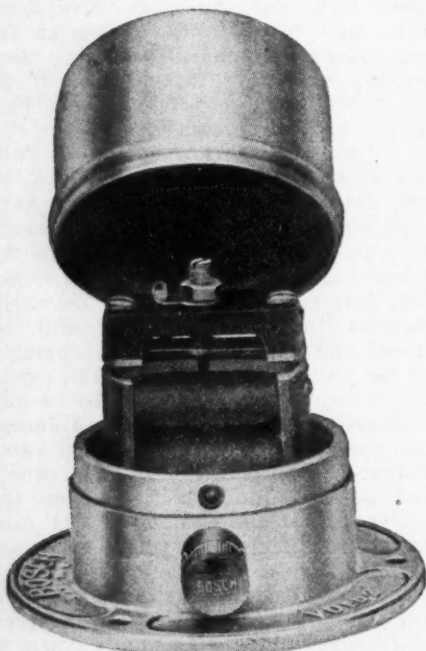


Fig. 16—Bosch Duplex coil with cover removed showing interior

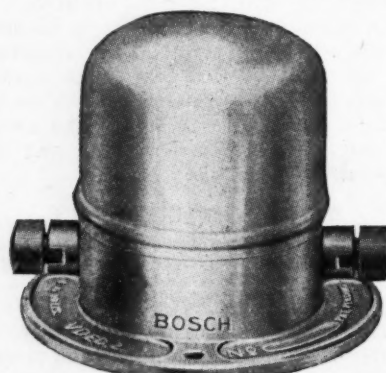


Fig. 18—Exterior view of Bosch Duplex coil showing terminal posts

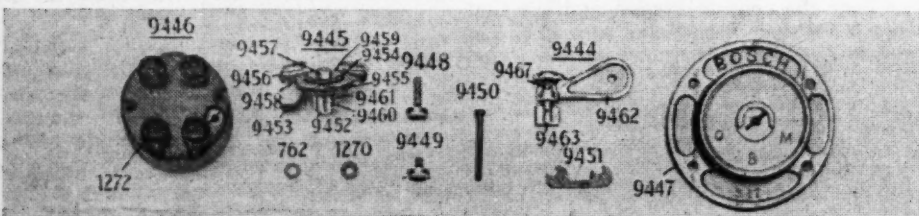


Fig. 17—Bosch Duplex coil disassembled

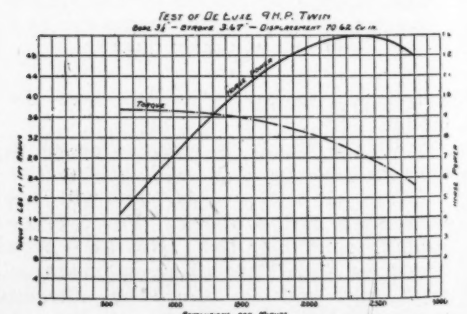


Fig. 19—Horsepower curve of 2-cylinder Spacke engine

ber, is put to work. It is claimed that in the limited extent of this accumulation lies the secret of the non-knocking of the sleeve valve engine.

SPACKE POWER CURVE

Q—Publish power curve of engine used in Spacke car.—Howell S. Topping, Wainscott, L. I., N. Y.

The Electric System

DUPLEX IGNITION SYSTEMS

Q—Explain the action of the duplex system of ignition for the Bosch, Simms, Huff, Splitdorf and Dixie magnetos and give wiring diagrams of each system.

2—Show important parts of each magneto, the breaker box, carbon brushes, commutator coil and coil connections.

3—Show the front and rear views of switches of each type.—E. Johnson, Kansas City, Mo.

1—Inasmuch as it would require too much space to describe all the systems named, it will be necessary to confine the answer to one and the Bosch is selected for the purpose. The complete system operates on one set of plugs and consists of a high tension magneto, low tension vibrating coil, switch and battery. With the exception of the Bosch D and DR types practically any of this make of magneto can be used in this combination without alteration. The primary circuit of the magneto armature is included in the battery circuit, being in series with the battery and the coil and the action of the battery is to supplement the normal action of the magneto. With the switch in the battery position current from the battery passes through the vibrating coil to the insulated magneto grounding terminal, the inner end of which is in contact with the head of the magneto interrupter fastening screw. To separate diagrams, for the grounded and return systems, are shown in Fig. 20. The interrupter fastening screw, in turn, is connected with the end of the armature primary circuit so that, when the magneto interrupter contacts are open, the battery current passes through the armature primary circuit to its beginning or grounded end, then returning to the battery through the ground. When the magneto interrupter contacts are closed, however, the current from the battery, after reaching the interrupter fastening screw, passes to the interrupter contact block, then across the magneto interrupter contacts and so to the ground, thus completing the circuit to the battery without passing through the magneto armature pri-

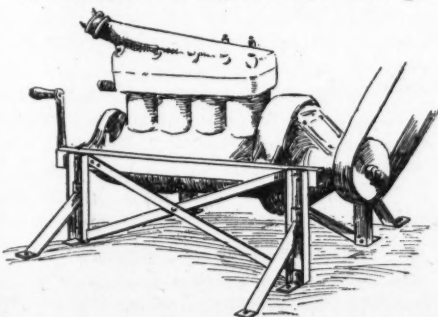


Fig. 20—An easily made stand for the Ford engine

Diagram of the DeLuxe engine used on the Spacke car is shown in Fig. 19.

BUICK COMPRESSION PRESSURE

Q—What is the theoretical compression of the Buick car, model D-44?—Lee Bagley, Springfield, Ohio.

The Buick Motor Co. states that the compression on the engine of the D-44 model is 45 lbs.

mary circuit. When the switch is in the battery position each separation of the magneto interrupter contacts throws the current from the battery and vibrating coil into the primary circuit of the magneto armature, supplementing the current generated by the magneto itself through the rotation of the armature. This induces in the armature secondary circuit a powerful sparking current which, on account of the vibrator action of the coil, appears not as a single spark but a series of intense sparks that, at lowest engine cranking speed, will ignite any mixture. The sparking current thus produced is distributed in the usual way through the magneto distributor to the plugs.

2—These are shown in Figs. 21 and 22.

3—The inside and outside of the duplex coil and the parts of the switch are shown in Fig. 17.

BOSCH WIRING DIAGRAM

Q—Publish a diagram showing the wiring of a Bosch ZR4 low-tension magneto and show proper gears to be used in its installation on a four-cylinder,

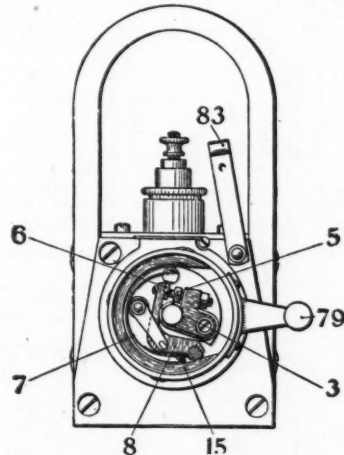


Fig. 21—View of the breaker box on the Bosch magneto

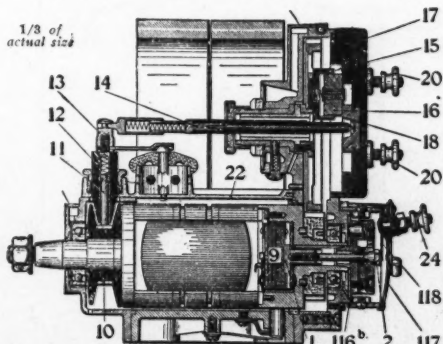


Fig. 22—Cross-section of the Bosch DU4 magneto

four-cycle Twin City, 40, gas tractor.—C. B. Burke, Lethbridge, Alta.

The Z R 4 Bosch magneto is a high tension magneto and must be driven at one-half engine speed. The wiring diagram is shown in Fig. 24.

MAGNETO TROUBLES

Q—What causes the Model D Splitdorf breaker points to burn out on an E. M. F. 30; it is necessary to close set the points every 300 miles.

2—What causes a misfire when the spark is advanced?

3—When cranking the engine if I bring one cylinder to compression and then let it back the engine runs backwards. The engine has good compression but no power; hits on all four when spark is advanced. Would you advise a D4 Bosch magneto?—R. E. Hooper, Lincoln, Mont.

1—This may be caused by one of two things, either the condenser is burned out or the metal points are at fault. Due to the fact that the points are probably old it would be well to replace them and see if this will remedy the trouble. If not the condenser is undoubtedly burned out.

2—Misfiring when the spark is advanced is probably due to magneto trouble. The fact that the breaker points burn out at very short intervals indicates that there is a very hot spark at the points and a weak spark at the spark plugs.

3—If the engine backfires when the spark is retarded, it is probably retarded too far. We cannot say whether it is

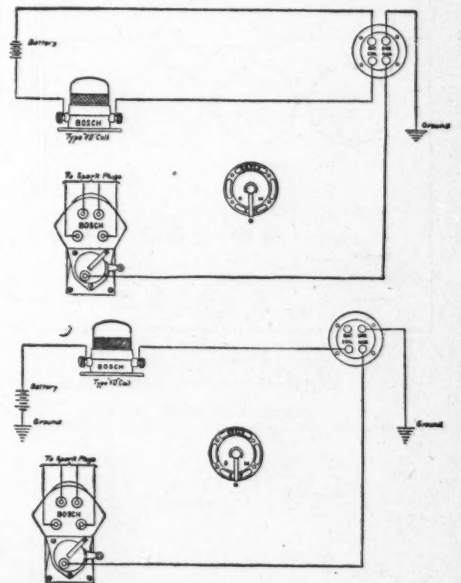


Fig. 23—Wiring connections on the Bosch DU4 magneto

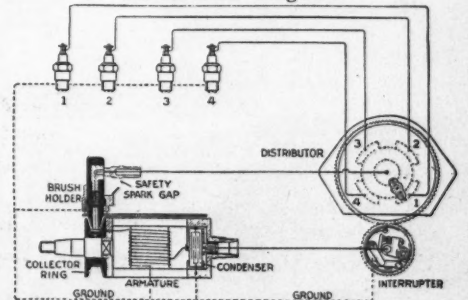


Fig. 24—Sectional wiring view showing path of current through magneto, breaker, distributor and spark plugs

necessary to install a new magneto or not, but if you intend to make a change you will have to decide from the claims made by the various companies.

GENERATOR SIZES

Q—State proper size of generator for a Ford engine and what should be the gasoline consumption for a 10 hr. run?

2—State proper size of generator for an E-M-F driven direct from propeller shaft; would lights be steady? Desire about a 5 kw. 110-volt outfit.—Matawan Garage, Matawan, Minn.

1—A Ford engine could handle a 10 kw. generator, but the generator can not be overloaded very much. The fuel consumption would be about 22 gal. for a 10 hr. run.

2—An E-M-F engine would drive a 15 kw. generator which could be overloaded about 10 per cent. A 5 kw. generator ought to work satisfactorily and the lights will be steady.

TESTING SWITCHBOARD

Q—Publish wiring diagram and illustrate layout of ammeter and voltmeter for generator, starter and magneto testing board.—R. J. James, The Auto Hospital, Apple River, Ill.

The wiring diagram and illustrated layout of the testing board is shown in Fig. 25. The dimensions have been omitted because the board will have to be built according to the amount of space available and the equipment you

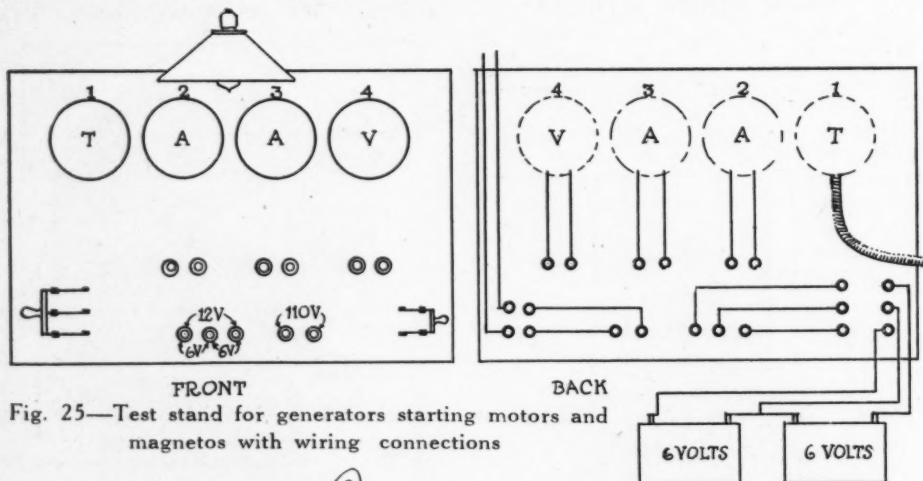


Fig. 25—Test stand for generators starting motors and magnetos with wiring connections

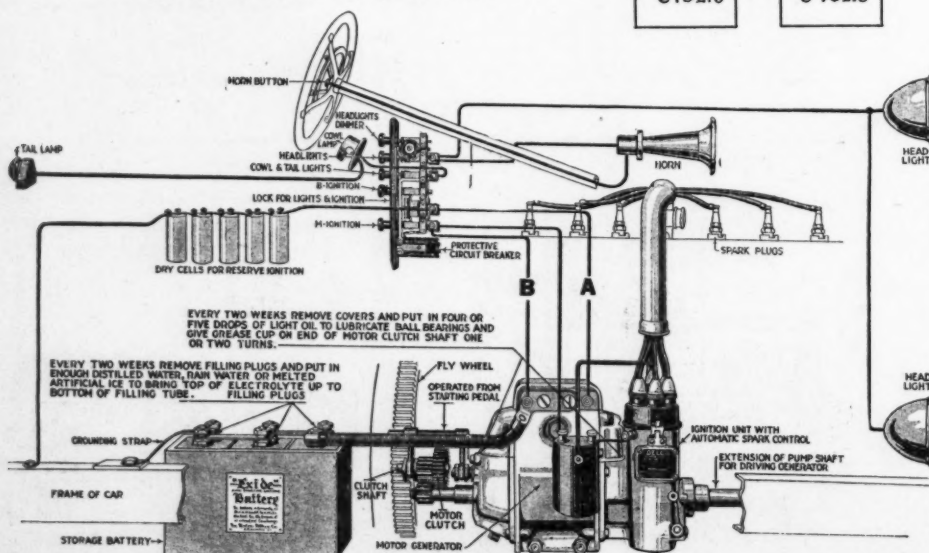


Fig. 8

Fig. 26—Perspective view of Buick Delco system used on 1914 model

have, or intend to buy for its construction. A tachometer is shown on the board for it will be necessary to provide some means of driving the generator or machine under test and you will have to know at what speed it is running. If you have a small motor around the service station a suitable device for driving the machine under test can be built and placed on the bench under the testing board mounting. One of the ammeters should have a 0 to 5 scale, the other a 0 to 600 scale. A switch where a 110 volt line can be brought to the board is also shown and if conditions warrant,

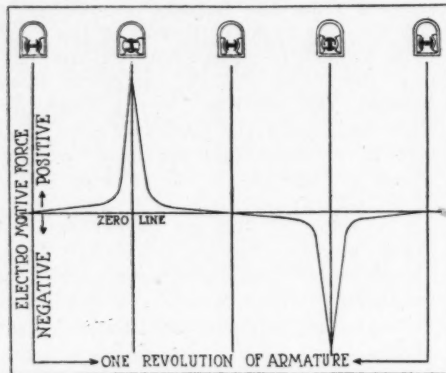


Fig. 27—Curve showing voltage generated in magneto at different armature positions

connections can be made from this switch to suit the case.

BOSCH MAGNETO

Q—Could a Bosch magneto be attached to a 1917 Chevrolet 490? Could it be geared to the flywheel by cutting correct gear on magneto or could it be attached by chain to driveshaft side of fanbelt?—B. A. Liehr, Versailles, Ill.

The Bosch Magneto Co. is prepared to furnish fittings, so its product may be attached to any make of car, and by addressing a letter to that concern you will be furnished a diagram and prices of the fittings. You can not gear to the flywheel even if the gears can be cut, for you will have to reduce instead of raise the gear ratio. It is customary to take the drive off the camshaft or crankshaft, it must be from some rotating part that has positive drive in order to time with the crankshaft.

BUICK DELCO SYSTEM

Q—Publish diagram of the Delco system used on the Buick B-25.—R. Price, Bliss Vulcanizing Works, Bliss, Idaho.

This is shown in Fig. 26.

STARTING FORDS

Editor Motor Age—In several questions of late I have noticed many have had hard times starting "Ford" cars.

Now my experience on these cars as well as nearly every other make has extended over many years and so far have never had a customer make this same complaint the second time for they all told the same thing. "Leave your emergency brake lever forward in the same position as when running on the road when you stop your car for 30 min. or more on a cold day. It forces the oil from between the clutch discs when oil is warm, then if the oil is cold and stiff when you try to start the car next time, just pull the lever back to the neutral position and the engine will start easily. This is much more necessary on the new model "starter" cars than on those with just the old "Armstrong" starters in order not to put unnecessary strain on the battery and starting motors.—F. G. Stevenson, Afton, Ia.

CHEVROLET OVERHEATS

Q—My 1917 Chevrolet 490 has given me trouble through overheating and this condition has existed from the time I purchased it in the spring of 1917 up to the present. The installation of a new engine and radiator has not remedied the difficulty. What do you think causes this continued overheating?—Frederick F. Zepp, Vallejo, Calif.

This trouble is not general with this model Chevrolet and the overheating is probably caused by faulty ignition or poor carburetion rather than a defective cooling system. Very often very bad overheating occurs because the spark is retarded too far. It would be well to check up the carburetion carefully because if the nozzle is too large you are probably getting too rich a mixture which will cause excessive heating.

NASH STARTING TROUBLE

Q—Give a few suggestions which would improve the starting of a 5-passenger Nash 681 touring car. The ignition, carburetion, vacuum system, timing, starting motor and everything is correctly adjusted. What is meant by correctly adjusted

is that everything tests out correctly. The starting motor turns the engine over fast enough, there is a good healthy spark at all times, lots of gasoline to the carburetor. Filled the radiator with hot water, heated manifolds with blow torch and no life at all. This car has always been difficult to start.—Daniel E. McCauley, Ironwood, Mich.

The next time you start the engine try with the throttle almost closed; or, better still, work the foot throttle a little—open and closing. Too often the motorist attempts to start the engine with the throttle wide open, thus destroying the vacuum and preventing the engine to take its charge. At the same time it is possible your valve stem guides are so badly worn that the engine draws too much air past the stems and does not get a sufficient charge of fuel. Naturally after the engine has been run a while and the parts have warmed there is enough expansion to remedy the trouble to a certain extent. Then, too, the engine being in operation, will take care of the matter automatically, because you probably give it a sufficiently rich mixture to make up for the overabundance of air.

12 VOLT DELCO IGNITION

Q—The Bosch magneto of a 1915 Case has been removed and a 12-volt Delco ignition unit from a 1917 Dodge installed. Will this work successfully on the Case six-volt battery? The engine runs good and does not miss but does not pull good.—Orville Stevens, Alliance, Neb.

This system will not work successfully using a six-volt battery. The design calls for a 12-volt battery and we advise you to purchase and install a new battery.

MAGNETO ELECTRICAL PRESSURE

Q—What make of magneto generates direct current?—R. F. Dickson, Kansas City, Mo.

The magneto generates a variable electric pressure as shown in Fig. 27. There are several companies on the market manufacturing a magneto generator. The Bosch company has a magneto generator system which, of course, provides direct current and full information can be obtained by writing to them.

GERMAN SILVER WIRE

Q—What is the resistance in ohms per hundred feet of size 20 and 25 B & S gage german silver uninsulated wire? What is the carrying capacity in amperes of each at 110 volts?—D. W. Lance, Oklahoma City, Okla.

For German silver wire containing 18 per cent nickel the resistance of 100 feet of 20 B&S gage is 19.55 ohms and 25 gage 62.4 ohms. The 20 gage wire will fuse at 30 amp. and the 25 gage at about 12.5 amp.

DIM LIGHTS

Q—What causes the light on a 1920 Buick Six to become dim at low and high engine speed? The lights are good at 15 or 20 m. p. h.—Jake Luft, Kingsdown, Kans.

This is probably due to the poor condition of the battery and it should be examined; at best it should be charged. Up to a certain engine speed you are lighting from the battery, then the generator takes hold when the speed is increased, so the generator is supplying the current. After a certain engine

speed has been reached the generator is cut out and the battery comes into work. Have the battery looked over and tested.

FORD HIGH-TENSION MAGNETO

Q—Would I be justified in spending \$50 or \$60 in a high-tension magneto for better ignition and to do away with the troublesome timer and coil now on the 1920 Ford? I understand such an installation would add extra speed, considerable more power, cooler engine and a saving of gas on account of the advanced spark and hotter fire.—M. W. Betteridge, North Fork, Cal.

The installation of a high-tension magneto would prove very satisfactory. It is a very reliable source of ignition and warrants an expenditure of \$50 or \$60.

CADILLAC WIRING DIAGRAM

Q—Am building a speedster from a 1913 Cadillac. Desire to remove the sidelights, the speedometer light and the horn. Also desire to do away with the voltage regulator if possible.—F. A. Cohlhupp, East End Garage, Brookville, Pa.

This diagram is shown in Fig. 28. The wiring to cut out the sidelights, horn and speedometer light can easily be re-

moved but we do not advise tampering with the voltage regulator wiring.

OAKLAND WIRING DIAGRAM

Q—Publish wiring diagram of the 1916 6-cylinder Oakland.—H. S. Brown, Newark, N. J.

2—Diagram of the 1916 Oakland is shown in Fig. 29.

SAFETY SPARK GAP

Q—Has the high-tension coil, such as used on the Delco and Remy electric systems, a safety spark gap, and where is it located?

2—If there is no safety gap, where does the spark go when engine misses?—Ben Griffith, Evanston, Ill.

1—In systems using a safety spark gap the gap was connected in series with the primary winding. Both the Delco and the Remy coils are provided with a resistance unit that is connected in series with the primary winding. In case of a misfire or at speeds when the circuit breaker remains closed for a comparatively long period which increases the current consumption and has a ten-

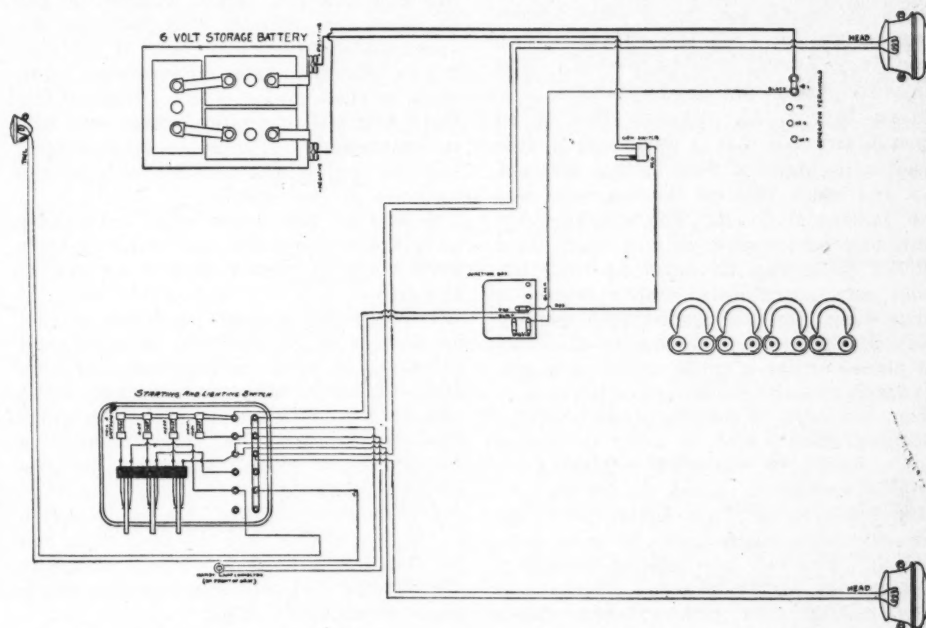
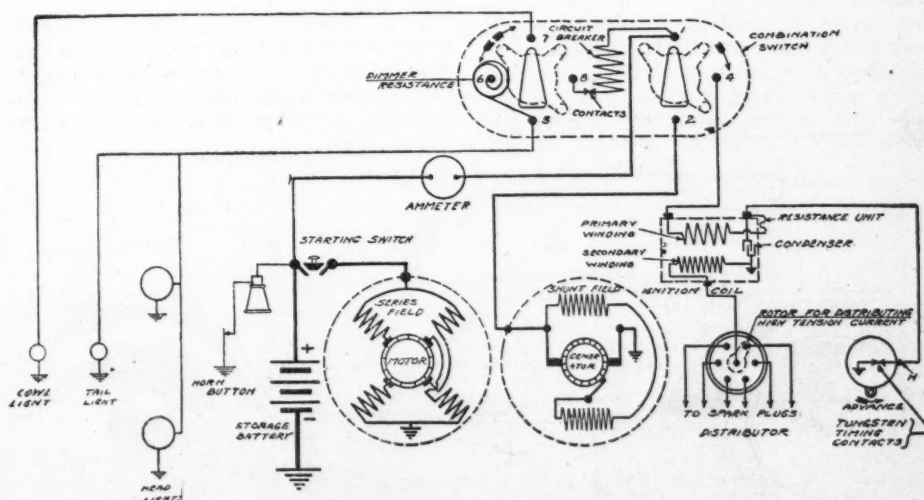


Fig. 28—Wiring diagram of the 1913 Cadillac showing the lighting circuits



1916 OAKLAND 32 B. DELCO SYSTEM.

Fig. 29

dency to overheat the coil, the resistance unit acts as a current limiting device and takes up the excess.

2—It will in time result in burning out the high tension circuit of the ignition coil.

Rebuilding

BRONZE HOOD

Q—Instruct how to gold bronze hood, cowl and wheels of a speedster. What material should be used?

2—Illustrate a speedster without a pressed steel rear end on body.

3—Publish addresses of firms who handle or make the high narrow radiators for speedsters and firms who sell speedster supplies.—H. Dunlop, Keane's Garage, Steubenville, Ohio.

1—Any paint store can supply you with gold bronze and banana oil and this, mixed, can be applied with a small brush. Of course, goldleaf will make a better job but this is too expensive now. The bronze, if carefully applied, and then varnished over, will make a pretty good piece of work. This is what was used on Barney Oldfield's "Golden Egg" racing car and that looked like a ball of gold.

2—You should have watched the columns of *MOTOR AGE* for a Ford speedster design, for such has appeared with frequency during the past year. The simplest form of Ford speedster is shown in Fig. 30, although this is an open affair. All that is necessary in this case is to make a well fitting, straight sill and place this on the frame of the car, bolting it down. The steering column can be lowered to suit, individual bucket seats can be obtained from almost any automobile supply house, a large tank can be placed immediately back of the seats and back of this can be placed either a small trunk or a box in which to carry tools, spare tubes, etc. From the edge of the trunk set a round platform upon which to carry the spare tire. Now you have a pretty good looking speedster. Many do not care to have fenders, but it is better to equip the car with some form of mud protection. You can use canvas, attaching to the ends of the running boards and then resting over irons placed where most convenient. One such job seen in Chicago recently utilized the running board for a tool box; that is, a tool box the width and length of the running board was made and with a depth inside of about 2 in., so that in this space all extra parts can be carried.

3—Any of the radiator concerns ad-

vertising in *MOTOR AGE* can make a radiator to suit your needs; as a matter of fact, you can buy such a radiator all ready made up.

REBUILDING A MARMON 32

Q—In rebuilding a Marmon 32 into a roadster would I get any better results from the engine by advancing the camshaft so it would open the valves sooner?

2—What carburetor and size gave the Marmon company the best results? The one I am using is 1½ in. Would a 1½ in. do just as well?

3—Would shortening the intake manifold give better results?

4—What is the gear ratio of this car, I want to gear my car faster.

5—Is there a salvage company in Indianapolis handling Marmon gears?

6—After having the front springs rearched, the rear spring throws the rear higher than the front. How can this be overcome?—John Smith, Cincinnati, O.

1—A camshaft that will give a higher lift and admit a larger charge of gas to enter the cylinder will increase the speed and give more power. If the timing is changed, using the present camshaft so that the gears are advanced one tooth you will get more power and better running conditions at high speeds, but the engine will not idle well or run as good at low speeds.

2—We do not know what carburetor gave the best results, but think in your case a 1½ in. would do just as well as the 1½.

3—With the present condition of fuel as it is a short manifold is absolutely essential to good carburetion. If possible install a hot-spot manifold. The use of a long manifold allows a great deal of condensation and results in heavy carbon deposit and very unsatisfactory running.

4—The gear ratio of this car is 3.4 to 1. It is probable that the gear ratio can be changed to 3 to 1 without changing the housing and this ought to give you a speed of about 75 m.p.h.

5—The Marmon company is in a position to furnish parts for any of the cars they have built.

6—If there is very much difference between the front and rear springs they will have to be rearched and adjustments made to even them up. However, if there is very little difference the

front springs can be raised by placing shims between the front axle pads and the springs.

REBUILDING WINTON SIX

Q—Suggest how I might increase the speed of a Winton Six.

2—Would a vacuum tank be better than the original gas supply system?

3—Could this car be underslung at small expense? Present tires are 37 by 5.—Paul A. Heesen, Philadelphia, Pa.

1—Install lighter pistons and connecting rods. If you increase the size of the valve ports it will increase the volumetric efficiency of the engine and give more power. The installation of a high speed camshaft that will increase the valve lift will speed up the engine. If it is not possible to obtain one the valve timing can be changed by advancing the gears one tooth, which will give better running at high speeds, but poor running at low speeds. The gear ratio can probably be reduced to 2.75 to 1 with safety and this will aid a great deal in improving speed.

2—It would be very desirable to place the gasoline tank in the rear when rebuilding this car, and of course, a vacuum tank would be the proper thing to use.

3—This car can probably be underslung at small expense by any competent mechanic.

FORD REBUILDING

Q—Can a high speed camshaft made by the Laurel Motors Corp., of the type they use for Roof 16-valve head be used on a Ford racer which has no 16-valve head, but has enlarged valves and ports? If not, where can one suitable be secured?

2—What speed would a Ford cut down with racing body, weighing 750 pounds, valve ports reamed out ¾ in. larger valves, gear ratio 3 to 1 large exhaust manifolds and pipe, underslung 3 in. 30 by 3 wheels and tires and racing carburetor, make?

3—What else could be done to increase speed without the installation of 16-valve head.—T. A. Baideme, Baideme Raynor Garage, Westfield, N. Y.

1—The high speed camshaft made by the Laurel Motors Corp. can only be used with a 16 valve head. The Green Engineering Co., Fourth and St. Clair Sts., Dayton, Ohio, or the Noonan Mfg. Co., 220 W. Washington St., Paris, Ill., can probably furnish you with a suitable camshaft.

2—A Ford rebuilt as you specify should be able to make about 60 to 65 miles per hour.

3—In addition to the things mentioned the installation of a high-tension ignition system would help a great deal.

BODIES

Q—State the rear seat width of the Essex and Hudson Super Six.

2—Where could I obtain a body for an Essex chassis, the body to be about 5 or 6 in. wider and a little longer if practical?—D. V. Russell, Laona, Wis.

1—We have no information as to the width of the rear seat of either the Essex or the Hudson Super Six.

2—You can probably obtain a custom built body from

TIRE SIZES

The Federal Rubber Co. are making tires of odd sizes for 36 by 4 in. and 37 by 4½ in. rims. This is an addition to the answer published in the March 25 issue of *MOTOR AGE*.

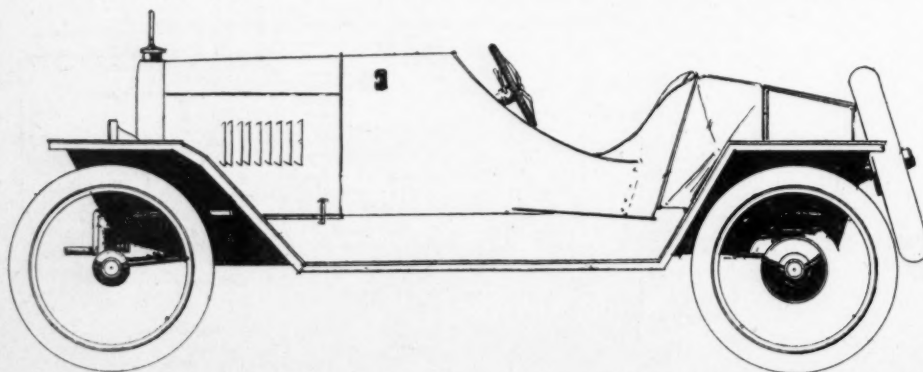


Fig. 30—Ford chassis with an easily built speedster body

Where Parts Can Be Obtained for Orphan Passenger Cars and Trucks

Motor Age Maintenance Data Sheet No. 93

One of a series of weekly pages of information valuable to service men and dealers—save this page

Abbott

Auto Gear Co., 844 Eighth Ave., New York.
Auto Gear & Parts Co., 201-93 Marietta St., Atlanta.
Auto Parts Co., 2801-2811 Preston Ave., Houston, Tex.
Auto Parts Co., 4116-18 Olive St., St. Louis.
Auto Salvage Co., 1701-03 Main St., Kansas City.
Auto Salvage Co., Tulsa, Okla.
Auto Salvage & Exchange Co., 1317-19 Locust St., Des Moines.
Levene Motor Co., 2200-18 Diamond St., Philadelphia.
Puritan Machine Co., 409 Lafayette Blvd., Detroit.
Sattler's Machine Shops & Works, 1601 Spring Garden St., Philadelphia.
Standard Motor Parts Co., New Castle, Ind.
The Boneyard, Washington, Ia.
Wichita Auto Wrecking Co., 801 W. Douglas Ave., Wichita.

Adams

Longaker Co., V. A., 448-50 N. Capitol Ave., Indianapolis.

Aerocar

Auto Gear Co., 844 Eighth Ave., New York.
Auto Gear & Parts Co., 291-93 Marietta St., Atlanta, Ga.
Auto Salvage & Exchange Co., 1317-19 Locust St., Des Moines.
Puritan Machine Co., 409 Lafayette Blvd., Detroit.

Aleo

Alco Service Co., 158-62 N. 22nd St., Philadelphia.
American Locomotive Co., Providence, R. I.
Auto Salvage Co., 1701-03 Main St., Kansas City.
International Motor Co., West End Ave. and 64th St., New York.
Levene Motor Co., 2200-18 Diamond St., Philadelphia.
Puritan Machine Co., 409 Lafayette Blvd., Detroit.

Alpena

Auto Gear & Parts Co., 291-93 Marietta St., Atlanta.
Auto Salvage & Exchange Co., 1317-19 Locust St., Des Moines.
Puritan Machine Co., 409 Lafayette Blvd., Detroit.

Alter

American Motors Parts Co., 430 N. Capitol Ave., Indianapolis.
Auto Gear Co., 1404 Hennepin Ave., Minneapolis.
Auto Gear & Parts Co., 291-93 Marietta St., Atlanta.
Puritan Machine Co., 409 Lafayette Blvd., Detroit.

American

American Motors Parts Co., 430 N. Capitol Ave., Indianapolis.
Auto Gear Co., 1404 Hennepin Ave., Minneapolis.
Auto Gear & Parts Co., 291-93 Marietta St., Atlanta.
Auto Gear Co., 844 Eighth Ave., New York.
Auto Parts Co., 2801-11 Preston Ave., Houston, Tex.
Auto Parts Co., 4116 Olive St., St. Louis.
Longaker Co., V. A., 448-50 N. Capitol Ave., Indianapolis.
Purt Motor Car Co., W. J., Pico and Hope Sts., Los Angeles.
Standard Motor Parts Co., New Castle, Ind.
Wolf Auto Parts & Tire Co., I., 619 N. Illinois St., Indianapolis.

American-Underslung

American Motors Parts Co., 430 N. Capitol Ave., Indianapolis.
Auto Gear & Parts Co., 291-93 Marietta St., Atlanta.
Auto Salvage Co., 1701 Main St., Kansas City.
Longaker Co., V. A., 448-50 N. Capitol Ave., Indianapolis.
Puritan Machine Co., 409 Lafayette Blvd., Detroit.

American Mors

St. Louis Car Co., 8000 N. Broadway, St. Louis.
Wichita Auto Wrecking Co., 805-809 W. Douglas Ave., Wichita.

Amplex

Gillette Motors Co., Mishawaka, Ind.
Gorey & Co., Jos. C., 354 W. 50th St., New York.
Puritan Machine Co., 409 Lafayette Blvd., Detroit.

Austin

Puritan Machine Co., 409 Lafayette Blvd., Detroit.

Bimel

American Motor Parts Co., 430 N. Capitol Ave., Indianapolis.
Bimel Automobile Co., Washington Ave. and Geisendorff St., Indianapolis.
Service Gear & Machine Co., Reading, Pa.

Black Crow

Crow-Elkhart Motor Co., Elkhart, Ind.

Briggs-Detroit

Levene Motor Co., 2200 Diamond St., Philadelphia.
Midland Motor Co., 2029 Michigan Ave., Chicago.
Puritan Machine Co., 409 Lafayette Blvd., Detroit.

Brown

Great Western Automobile Co., Kalamazoo, Mich.
The Boneyard, Washington, Ia.

Brush

Auto Parts Co., 2801-11 Preston Ave., Houston, Tex.
Auto Parts Co., 4116-18 Olive St., St. Louis.
Auto Salvage Co., 1701 Main St., Kansas City.
Auto Salvage & Exchange Co., 1317-19 Locust St., Des Moines.
Davidson Repair Shop, 227 W. 64th St., New York.
Puritan Machine Co., 409 Lafayette Blvd., Detroit.
Service Gear & Machine Co., Reading, Pa.
Standard Motor Parts Co., New Castle, Ind.
The Boneyard, Washington, Ia.
Wolf Auto Parts & Tire Co., I., 619 N. Illinois St., Indianapolis.

Badger

Auto Gear Co., 844 Eighth Ave., New York.
Auto Gear & Parts Co., 291-93 Marietta St., Atlanta.
Auto Salvage & Exchange Co., 1317 Locust St., Des Moines.
Puritan Machine Co., 409 Lafayette Blvd., Detroit.
Schultz & Harder, Columbus, Wis.

Benham

Dayton Auto Parts Co., 1777 Broadway, New York.
Gorey & Co., Jos. C., 354 W. 50th St., New York.
Puritan Machine Co., 409 Lafayette Blvd., Detroit.

Benz

Gorey & Co., Jos. C., 354 W. 50th St., New York.

Bergdoll

Auto Gear Co., 844 Eighth St., New York.
Auto Gear & Parts Co., 291-93 Marietta St., Atlanta.
Auto Parts Co., 4116 Olive St., St. Louis.
Bergdoll Co., L. J., Philadelphia.
Gorey & Co., Jos. C., 354 West 50th St., New York.
Levene Motor Co., 2200 Diamond St., Philadelphia.
Puritan Machine Co., 409 Lafayette Blvd., Detroit.
Service Gear & Machine Co., Reading, Pa.
Schober, G. M., 3339 Market St., Philadelphia.

Berlett

American Locomotive Co., Providence, R. I.

Carhart

Auto Gear Co., 844 Eighth Ave., New York.
Auto Gear & Parts Co., 291-93 Marietta St., Atlanta.
Dayton Auto Parts Co., 1777 Broadway, New York.
Gorey & Co., Jos. C., 354 W. 50th St., New York.
Puritan Machine Co., 422 Lafayette Blvd., Detroit.

Carnation

Auto Gear Co., 1404 Hennepin Ave., Minneapolis.
Auto Gear Co., 844 Eighth Ave., New York.
Auto Gear & Parts Co., 291-93 Marietta St., Atlanta.
Carnation Motor Co., Detroit.
Puritan Machine Co., 409 Lafayette Blvd., Detroit.
Standard Motor Parts Co., Detroit.
Wolf Auto Parts & Tire Co., I., 619 N. Illinois St., Indianapolis.

Cartercar

Auto Parts Co., 2801-11 Preston Ave., Houston, Tex.
Puritan Machine Co., 409 Lafayette Blvd., Detroit.
The Boneyard, Washington, Ia.
Wichita Auto Wrecking Co., 807 W. Douglas Ave., Wichita.
Wolf Auto Parts & Tire Co., I., 619 N. Illinois St., Indianapolis.

Chadwick

Auto Salvage Co., 1701-03 Main St., Kansas City.
Berkholz, Louis, 223 N. Fourth St., Philadelphia.

Chase

Auto Parts Co., 4116 Olive St., St. Louis.

Cino

Auto Salvage Co., 1701-03 Main St., Kansas City.
Northway Auto Parts & Sales Co., 223 Kearney St., Cincinnati.
Puritan Machine Co., 409 Lafayette Blvd., Detroit.
Queen City Auto Parts Co., 633 Main St., Cincinnati.

Clark

Auto Gear & Parts Co., 291-93 Marietta St., Atlanta.
Puritan Machine Co., 409 Lafayette Blvd., Detroit.
Wichita Auto Wrecking Co., 801 W. Douglas Ave., Wichita.
Wolf Auto Parts & Tire Co., I., 619 N. Illinois St., Indianapolis.

Colby

Auto Gear Co., 1404 Hennepin Ave., Minneapolis.
Harper, E. V., 306 S. Federal St., Mason City, Ia.
Puritan Machine Co., 409 Lafayette Blvd., Detroit.

Colley

Puritan Machine Co., 409 Lafayette Blvd., Detroit.

Columbia

Columbia Auto Repair Co., Hartford, Conn.
Standard Motor Parts Co., New Castle, Ind.

Columbia-Knight

Columbia Auto Repair Co., Hartford, Conn.
Standard Motor Parts Co., New Castle, Ind.

Columbus Electric

Butler Mfg. Co., Knightstown, Ind.
Columbus Buggy Parts Co., Columbus, O.

Continental

Auto Parts Co., 4116 Olive St., St. Louis.
Continental Auto Parts Co., Knightstown, Ind.
Wolf Auto Parts & Tire Co., I., 619 N. Illinois St., Indianapolis.

Corbitt

Puritan Machine Co., 409 Lafayette Blvd., Detroit.

Corbin

Puritan Machine Co., 409 Lafayette Blvd., Detroit.

Cornelian

C. E. Wood, Allegan, Mich.

Courier

Auto Gear Co., 1404 Hennepin Ave., Minneapolis.
Auto Gear Co., 844 Eighth Ave., New York.
Auto Gear & Parts Co., 291-93 Marietta St., Atlanta.
Auto Parts Co., 2801-11 Preston Ave., Houston, Tex.
Dayton Auto Parts Co., 1777 Broadway, New York.
Gorey & Co., Jos. C., 354 W. 50th St., New York.
Puritan Machine Co., 409 Lafayette Blvd., Detroit.
Sattler's Machine Shops & Works, 1601 Spring Garden St., Philadelphia.
Service Gear & Machine Co., Reading, Pa.
Standard Motor Parts Co., Detroit.

Crow

Auto Gear Co., 1404 Hennepin Ave., Minneapolis.
Auto Gear Co., 844 Eighth Ave., New York.
Auto Gear & Parts Co., 291-93 Marietta St., Atlanta.
Auto Parts Co., 2801-11 Preston Ave., Houston, Tex.
Crow-Elkhart Motor Co., Elkhart, Ind.
Service Gear & Machine Co., Reading, Pa.

The Accessory Corner

New Fitments for the Car

Warman Radiator Guard

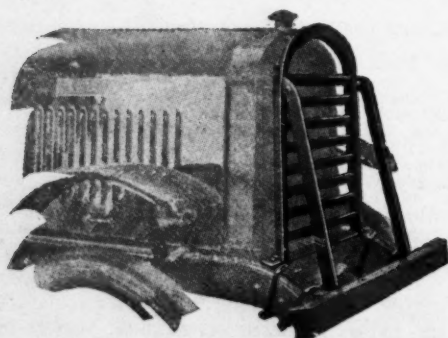
You may have competent drivers; might never have an accident, yet you may have a collision that will lay your truck up for days and possibly weeks. The Warman Radiator Guard is a very well constructed guard that will protect the radiator by having the force of a blow taken by the weight of the chassis. A direct blow on the forward brace pulls the guard away from the radiator instead of driving it in as with a rear brace guard. The lateral bars set at an angle of 45 deg. prevent projecting rods and bars, wagon tongues, etc., from penetrating to the radiator core which is properly protected without loss of radiation, the air merely being deflected. The guards shown in the illustration, manufactured by The Fundamental Corp., 270 Union Ave., Brooklyn, N. Y., sells from \$25 to \$30.

Luxry Shock Absorbers

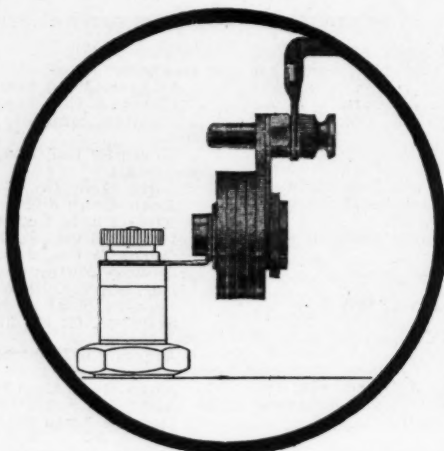
Luxry Shock Absorbers are built for Fords, are of very simple construction, strong and efficient. They are of double spring construction and are very easily installed on the car. In putting them on the car no holes are drilled, but the absorber is just bolted on as shown in the illustration. They are manufactured by the Specialty Device Co., 106 W. Third St., Cincinnati, and a complete set of four sells for \$18 f. o. b. factory.

Sparko-Gap

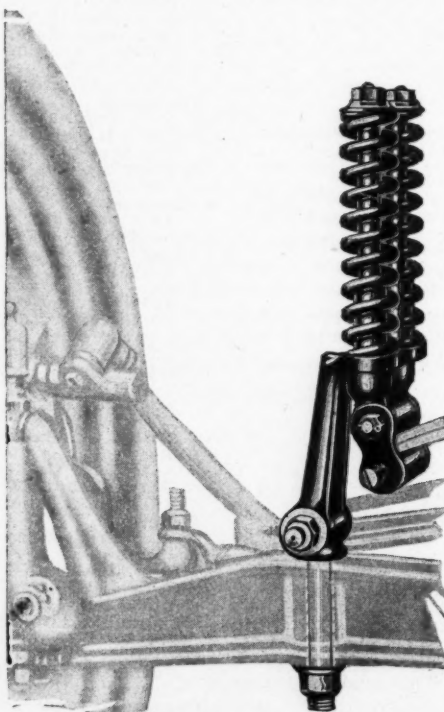
The Sparko-Gap, a device which was invented during the war and just released by the War Department, is a product of Sparko-Gap Co., 29 Beekman St., New York. This gap sells for \$1.50 and it is claimed that the Sparko-Gap will fire plug in conditions 250 times as difficult as will any ordinary ignition system without them; so that plugs will fire no matter how dirty they are and even with broken porcelain. It is also claimed that the French Government made it standard equipment on all their aeroplanes.



Warman radiator guard for protecting truck radiators from damage



Sparko-Gap spark intensifier



Luxry shock absorber for Fords



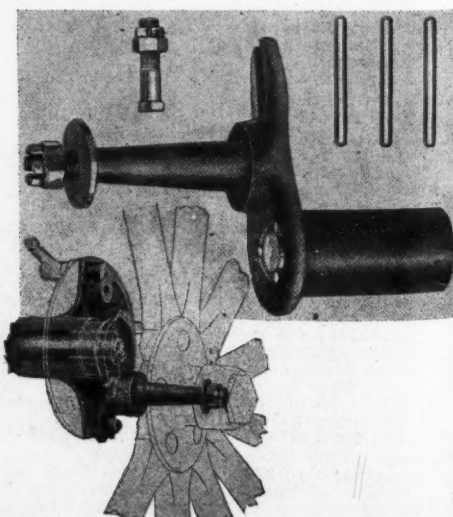
Full Ray headlight glare deflector

Full Ray Headlight Deflector

The great problem that confronts the motorist who drives at night is getting sufficient illumination of the road and still comply with the law. It is claimed that the non-transparent deflector shown in the illustration will cut off entirely all harmful glare and waste light without interfering in the least with the intensity of the illumination where it is needed for driving, and where the law requires it. It is a blind-like arrangement of metal slats which permit the reflected light to be thrown on the road in front of the car. All the rest of the light is thrown ahead and kept below the 42-in. line which is a law requirement. It is manufactured by the Bradsto Appliances, Inc., 65 Main St., Buffalo, and sells for \$3.50 with extra charge of twenty-five cents for points west of the Rockies.

Slip On Repair Axle

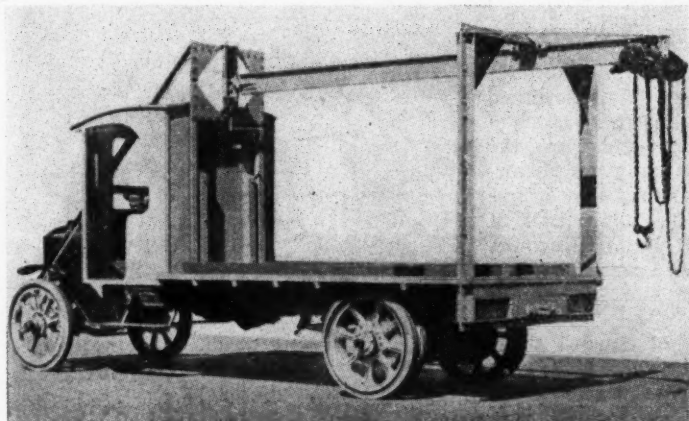
The slip on emergency repair axle is a device manufactured by The Slipon Co., Milwaukee, Wis. Its purposes is to provide a temporary repair on the Ford in case the drive shaft axle is broken as sometimes happens. The wheel is simply slipped over the spindle of the temporary axle and the bolt of the brake housing is slipped over the yoke of the repair axle. An eccentric collar fits over the broken stud of the shaft and knurled pins fit in the eccentric collar around the outside of the shaft. When the car is started the pins revolve slightly with the shaft, but cannot revolve very far because of the eccentric collar, which binds the shaft and holds it stationary. The list price of this accessory is \$6.



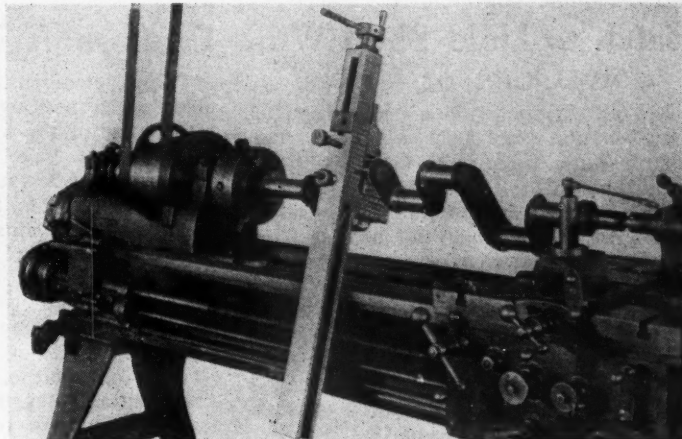
Slip On Ford Repair Axle

Service Equipment

Time Savers of the Shop



The Hendrickson truck crane can be attached to any service truck in about two hours' time



The Weber crankpin re-turning tool for truing crankshafts

Weber Re-Turning Tool

A most ingenious tool for expediting work on engine crankshafts has been invented by Alex Weber, a master mechanic of Los Angeles. It will be noted in the accompanying view of this device that it is a crankpin re-turning tool and works on a four-throw tractor crankshaft. The crankshaft is held between centers on a lathe. All four pins are turned true and finished in one setting in thirty minutes to an hour. The shaft is rotated very slowly. The tool rides around the pin, the handle resting against the ways.

At the top of the tool will be noticed the hand wheel which feeds the cutters into the pin. This wheel has a dial below that is graduated in thousandths. This dial can be locked by means of set screws in any position, thus making it easy to turn all pins to exactly the same size. The pin is held firmly in place independent of the cutter by three supports. One of these supports is a bronze shoe that can be adjusted while the tool is cutting. It starts at the same time, removing the least possible amount of metal. Made by the Sawyer-Weber Tool Mfg. Co. of Los Angeles, Calif.

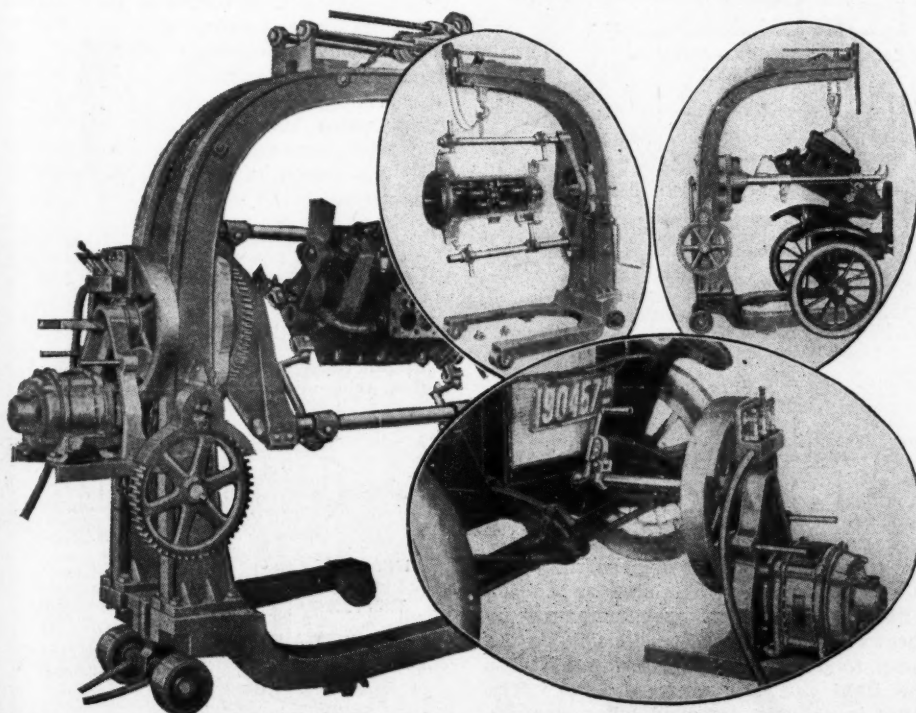
Eco Universal Engine Handling Machine

Service stations are constantly coming in touch with the problem of handling engines successfully and efficiently and they realize the necessity of a portable device which will do the work. The handling machine shown in the illustration is especially constructed to handle any engine without the use of special bolts or blocking as the universal clamping heads adjust themselves to any position or shape.

This machine is not limited to any one job but is a whole garage equipment in itself and takes half the labor off of engine or car handling. It is said that one man with the aid of this machine can remove from the chassis of any car, truck or tractor, any engine regardless of make or size, clamp it into the Every-way engine stand complete with the transmission, magneto and carburetor on, thereby enabling him to start up and run the engine on the stand. It is manufactured by the Western Mfg. Co., Oskaloosa, Iowa.

Hendrickson Truck Crane

Every service station that has a truck which they use as a trouble shooter should be equipped with some device which they can handle heavy loads, pick up cars that might be in the ditch, and for similar uses. The device shown in the illustration can also be used at very great advantage by the truck owner as he can load more efficiently, faster and with a smaller number of men. This crane manufactured by the Hendrickson Truck Crane Co., Peoples Gas building, Chicago, can be attached to any motor truck in about two hours' time. It is made in numerous sizes to fit trucks of different capacities and is equipped with a high speed hoist.



Eco universal engine handling machine is a portable device. It is not limited to any one job but is virtually a whole service station in itself

The Automotive Repair Shop

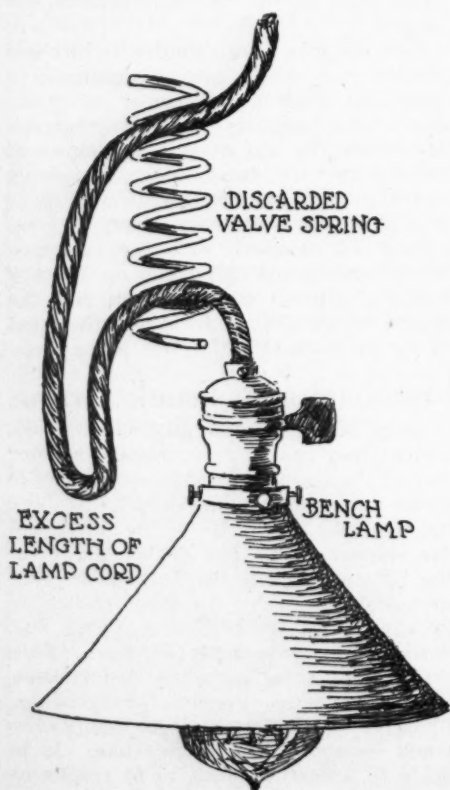
Practical Maintenance Hints

Catch to Hold Shop Window Open or Closed

Not all garage windows are provided with counter or sash weights. The sketch shows a simple form of catch and lock that will either hold the window open or closed and permits the window to be raised and held at any desired height. The catch is either a piece of sheet brass, steel or wood, secured to the window frame with a screw. This is quite as simple as a prop and the advantage of locking the window closed, safeguarding the tools and equipment, makes the fitting worth while, even though sash weights are in place.

Useful Screwdriver Kink

When one tries to put in or take out a short set screw with the ordinary screwdriver it requires a powerful grip and makes blistered hands. The difficulty can be solved by flattening a small section of the driver shank as shown in the illustration, and drilling a small hole in the center of it. This permits the inserting of a small drift pin or a file tang to give leverage for turning the screwdriver, yet this does not weaken the driver very much nor spoil it for use in the regular manner.

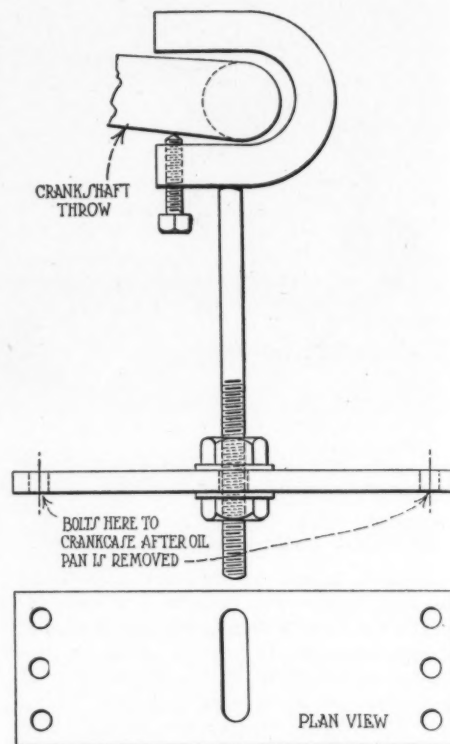


Valve spring used to hold lamp cord

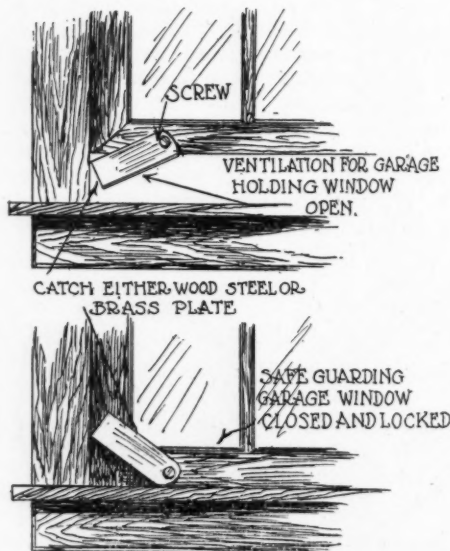
Crankshaft Play Detector

The exact amount of play in a crankshaft main bearing can be determined by the use of the tool shown in connection with a gage for registering the movement. The tool is simply a powerful apparatus for thrusting the crankshaft tightly against the upper half of the main bearing and for pulling the crankshaft against the lower half, the total movement being the amount of play in the bearing.

Obviously one of the chief advantages of the tool is the fact that it can be used without tearing the engine down any further than removing the oil pan. The tool is then inserted and its jaw clamped around the cheek of the crankshaft close to the bearing to be tested. The plate at the lower end is then bolted to the crankcase. By turning up on the adjusting nut under the plate the crankshaft is pulled down, and by turning down on the nut above the plate it is pulled up.



Crankshaft play detector



Catch to hold shop window open or closed

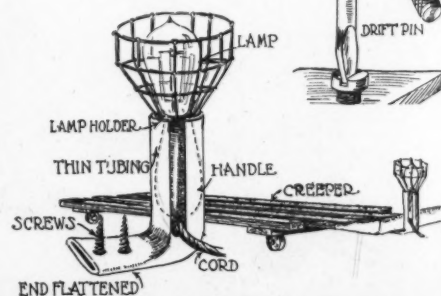
Convenience in Attaching Light to Creeper

A repairman will find the fixture shown in the sketch a convenience that is worth following. The creeper is fitted with a slotted bent tube, attached by screws to the head rest. This holds the lamp, focusing it on the work, and keeps the light out the workers' eyes. The lamp is quickly removed when desired, as the handle is only slipped into the socket.

VALVE SPRING ADJUSTER FOR LAMP CORD

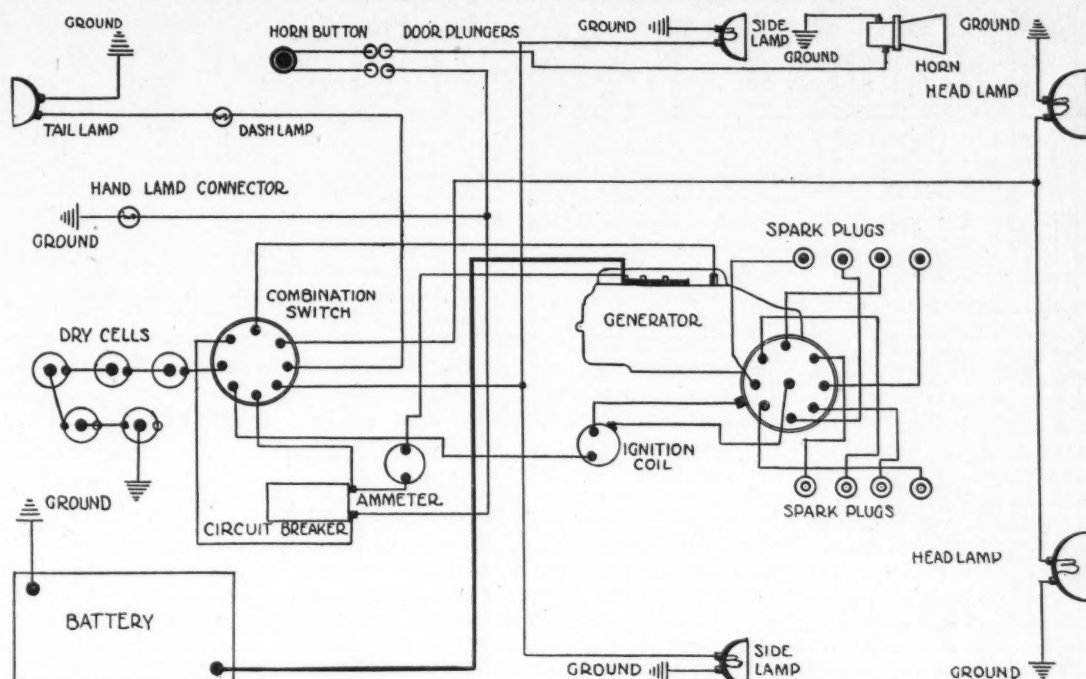
A valve spring that is discarded for imperfections still makes a serviceable adjuster for the lamp cord from a ceiling drop light, hanging over the work bench. Simply slip the electric wire between the coils as shown in the illustration.

It often takes a powerful grip to turn a short set screw with the ordinary screwdriver, but by drilling a hole in the side to allow a small drift pin to be inserted gives sufficient leverage to make it easy

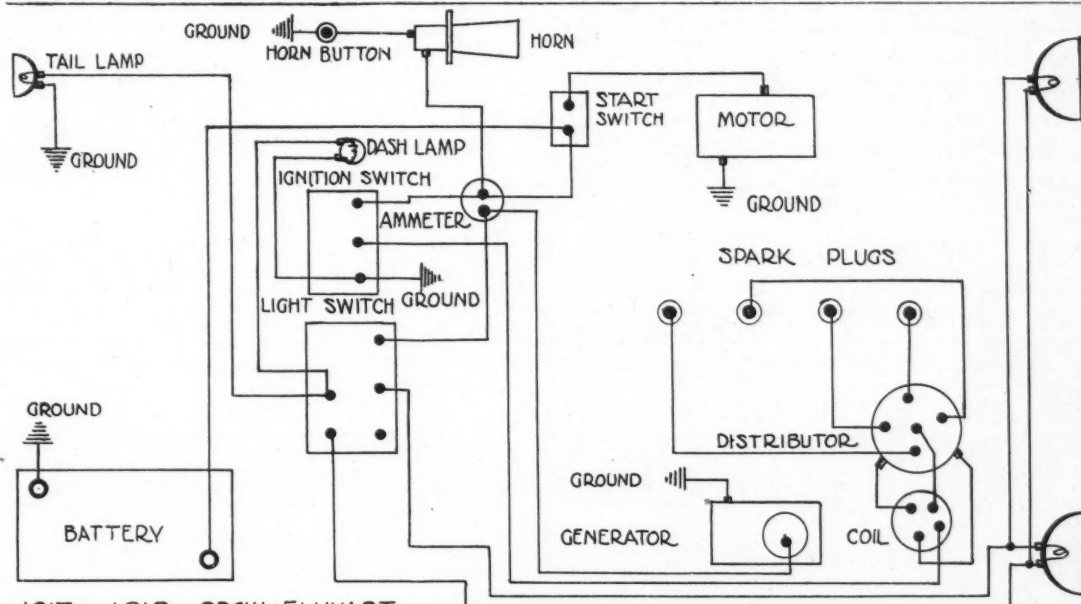


Attaching a light to the creeper

Motor Age Weekly Wiring Chart No. 74



1915 CADILLAC DELCO SYSTEM.

1917-1918 CROW-ELKHART
33-35-K34-K36 DYNETO
SYSTEM

THIS WEEK

1917-18 Crow-Elkhart

1915 Cadillac

Allen—Dec. 18, '19
Auburn—Nov. 27, '19; April 1, '20
Briscoe—Oct. 16, '19
Buick—Oct. 23, '19
Case—Oct. 2, '19
Crow-Elkhart—June 26, '19
Chalmers—Nov. 27, '19
Cutting—Nov. 6, '19
Daniels—Dec. 4, '19
Davis—Dec. 4, '19
Dixie—April 1, '20
Dodge—April 15, '20
Dorris—Dec. 11, '19
Dort—March 25, '20
Empire—Oct. 30, '19
Essex—Oct. 23, '19
May 15-22, '19

Franklin—June 19, '19; Dec. 11, '19
General Battery Charging—Sept. 25, '19
General Magneto Diagram—June 5, '19
Haynes—Oct. 9, '19
Hupmobile—Oct. 16, '19
Internal Connections—July 10-17-24, '19
Keeton—Nov. 6, '19
King—July 3, '19
Kissel—July 3, '19
Lexington—Jan. 1, '20
Liberty—Jan. 1, '20
Marmon—Dec. 25, '19; Jan. 22, '20
Maxwell—Aug. 14, '19
Mercer—Aug. 28, '19; Nov. 27, '19; March 25, '20
Mitchell—Jan. 8, '20
Monroe—Oct. 30, '19
Moon—Jan. 29, '20; March 11, '20
Moore—March 4, '20
Nash—March 11, '20
National—June 19, '19; Feb. 12, '20
Oakland—Oct. 16, '19; April 15, '20
Oldsmobile—April 8, '20

Olympian—Jan. 22, '20
Owen Magnetic—Sept. 18, '19
Packard—June 19, '19; July 31, '19; March 18, '20
Palge—July 3, '19
Paterson—June 26, '19; July 9, '19
Pierce-Arrow—Oct. 2, '19; Feb. 5, '20
Pilot—March 4, '20
Premier—Dec. 18, '19; Feb. 26, '20
Reo—Aug. 21, '19; Oct. 9, '19; Nov. 13, '19
Roamer—March 18, '20
Saxon—April 8, '20
Scripps-Booth—Jan. 15, '20
Stanley—June 26, '19
Stearns-Knight—Jan. 8, '20
Stephens—Feb. 12, '20
Studebaker—Dec. 25, '19
Stutz—Feb. 5, '20
Templar—Jan. 29, '20
Velle—Sept. 25, '19; Feb. 19, '20
Westcott—Jan. 15, '20
White—Sept. 25, '19; Feb. 19, '20
Willis-Knight—Feb. 26, '20
Special Systems for Fords—May 15-22, '19

Motor Age Farm-Lighting Specification Tables

Name and Model	Maker	Capacity	No. 20 watts	Lamp voltage	No. cy's	No. cycles	Make of engine	Horsepower	Fuel	Cooling	Power pulley	Generator drive	Make of generator	Make of battery	Battery amp. hours	Battery volt.	No. cells	Starting	Stopping	Governor	Price
Aerotruss...	Aerotruss Engine Co., La Porte, Ind.	15-25	15-25	40	1	4	Ida	1/2	G	Air	Opt.	Shaft	Imperial	Universal	130	32	16	S-Auto	S-Auto	Throttle	550
Alamo...	Alamo Farm Light Co., Omaha, Neb.	75-120	75-120	40	1	4	Ow	1/2	G	Water	Yes	Belt	Imperial	Universal	175	32	16	S-Auto	S-Auto	Throttle	600
Cushman, A	Cushman Motor Works, Lincoln, Neb.	1000	26-76	32	1	4	Ow	1/2	G	Water	Yes	Belt	Ow	Exide	260	32	16	S-Auto	S-Auto	Throttle	675
E		1000	25-85	32	1	4	Ow	1/2	G	Water	Yes	Belt	Ow	Exide	160	32	16	S-Auto	S-Auto	Throttle	475-545
Delco Lt., 3/4 KW, 32-volt	Domestic Engineering Co., Dayton, Ohio	1000	52-102	32	1	4	Ow	1/2	G	Air	No	Direct	Ow	Exide	80-160	32	16	Manual	Manual	Voltage	959
3 KW, 110-volt		3000	150	110	1	4	Ow	1/2	G	Air	No	Direct	Ow	Exide	80-160	112	56	Manual	Manual	Throttle	1295-1602
Dyneto, 5	Dyneto Electric Co., Syracuse, N. Y.	750	37	32	1	4	Ow	1/2	G	Water	Yes	Belt	Ow	Willard	80	32	16	S-Auto	S-Auto	Throttle	385
7		3000	150	110	1	4	Ow	1/2	G	Water	Yes	Belt	Ow	Willard	110	32	16	S-Auto	S-Auto	Throttle	410
9		600	10-42	32	1	4	Ow	1/2	G	Water	Yes	Belt	Ow	Willard	80	32	16	S-Auto	S-Auto	Throttle	460
L-4-F-7		1250	16-65	32	1	4	Ow	1/2	G	Water	Yes	Belt	Ow	Willard	95-275	32	16	S-Auto	S-Auto	Throttle	585
Everette	St. Paul Electric Co., St. Paul, Minn.	1000	75-150	32	1	4	Ow	1/2	G	Water	Yes	Belt	Ow	Willard	120	32	16	Manual	Manual	Throttle	540-670
Fairbanks-Morse, F-11-6	F. J. Binks-Morse & Co., Chicago	600	40	32	1	4	Ow	1/2	G	Water	Yes	Belt	Ow	Willard	120	32	16	Manual	Manual	Throttle	550
F-3-100		1500	65	32	1	4	Ow	1/2	G	Water	Yes	Belt	Ow	Willard	200	32	16	Manual	Manual	Throttle	550
F-6		3500	240	32	1	4	Ow	1/2	G	Water	Yes	Belt	Ow	Willard	200	32	16	Manual	Manual	Throttle	595
Fairmont, B-4	Fairmont Gas E. & R. M. Co., Fairmont, Minn.	1000	22-73	32	1	4	Ow	1/2	G	Water	Yes	Belt	Ow	Willard	80	32	16	Manual	Manual	Throttle	595
Geneco, A	General Gas-Electric Co., Hanover, Pa.	1000	22-73	32	1	4	Ow	1/2	G	Water	Yes	Belt	Ow	Willard	110	32	16	Manual	Manual	Throttle	595
B		3000	155-205	110	1	4	Ow	1/2	G	Water	Yes	Belt	Ow	Willard	110	110	54	S-Auto	S-Auto	Throttle	540
C		3000	204-243	110	1	4	Ow	1/2	G	Water	Yes	Belt	Ow	Willard	167	110	54	S-Auto	S-Auto	Throttle	540
D		3000	204-243	110	1	4	Ow	1/2	G	Water	Yes	Belt	Ow	Willard	167	110	54	S-Auto	S-Auto	Throttle	540
Gray & Davis	Boston...	750	30	110	1	4	Ow	1/2	G	Water	Yes	Belt	Ow	Willard	86	6	3	Auto	Auto	Electro-sole	450
Holt Power-Light, 110-volt	Automatic Light Co., Inc., Ludington, Mich.	600	27	32	1	4	Ow	1/2	G	Water	Yes	Belt	Ow	Willard	80	32	16	S-Auto	S-Auto	Throttle	335
Jupiter, 3	Perfection Storage Battery Co., Chicago	1000	67	32	1	4	Ow	1/2	G	Water	Yes	Belt	Ow	Willard	80	60	32	S-Auto	S-Auto	Throttle	910
Kohler	Kohler Co., Kohler, Wis.	1500	90	110	1	4	Ow	1/2	G	Water	Yes	Belt	Ow	Willard	26	24	12	Auto	Auto	Throttle	550
Lalley Light	Lalley Light Corp., Detroit	1000	50	32	1	4	Ow	1/2	G	Water	Yes	Belt	Ow	Willard	115	32	16	Manual	Manual	Throttle	550
Lauson-Edison, 201	John Lauson Mfg. Co., New Holstein, Wis.	1250	65	32	1	4	Ow	1/2	G	Water	Yes	Belt	Ow	Willard	80-115	32	16	Manual	Manual	Throttle	595
202-30		800	730	50	1	4	Ow	1/2	G	Water	Yes	Belt	Ow	Willard	38	50	26	Manual	Manual	Throttle	595
206-110		400	10-50	25	1	4	Ow	1/2	G	Water	Yes	Belt	Ow	Willard	75	52	26	Manual	Manual	Throttle	595
208-110		3500	27-154	25	1	4	Ow	1/2	G	Water	Yes	Belt	Ow	Willard	38	50	26	Manual	Manual	Throttle	595
209-110		800	10-25	30	1	4	Ow	1/2	G	Water	Yes	Belt	Ow	Willard	75	52	26	Manual	Manual	Throttle	595
210-110		800	15-40	30	1	4	Ow	1/2	G	Water	Yes	Belt	Ow	Willard	75	52	26	Manual	Manual	Throttle	595
211-110		800	15-40	30	1	4	Ow	1/2	G	Water	Yes	Belt	Ow	Willard	75	52	26	Manual	Manual	Throttle	595
212-110		800	15-40	30	1	4	Ow	1/2	G	Water	Yes	Belt	Ow	Willard	75	52	26	Manual	Manual	Throttle	595
213-110		800	15-40	30	1	4	Ow	1/2	G	Water	Yes	Belt	Ow	Willard	75	52	26	Manual	Manual	Throttle	595
214-110		800	15-40	30	1	4	Ow	1/2	G	Water	Yes	Belt	Ow	Willard	75	52	26	Manual	Manual	Throttle	595
215-110		800	15-40	30	1	4	Ow	1/2	G	Water	Yes	Belt	Ow	Willard	75	52	26	Manual	Manual	Throttle	595
216-110		800	15-40	30	1	4	Ow	1/2	G	Water	Yes	Belt	Ow	Willard	75	52	26	Manual	Manual	Throttle	595
217-110		800	15-40	30	1	4	Ow	1/2	G	Water	Yes	Belt	Ow	Willard	75	52	26	Manual	Manual	Throttle	595
218-110		800	15-40	30	1	4	Ow	1/2	G	Water	Yes	Belt	Ow	Willard	75	52	26	Manual	Manual	Throttle	595
219-110		800	15-40	30	1	4	Ow	1/2	G	Water	Yes	Belt	Ow	Willard	75	52	26	Manual	Manual	Throttle	595
220-110		800	15-40	30	1	4	Ow	1/2	G	Water	Yes	Belt	Ow	Willard	75	52	26	Manual	Manual	Throttle	595
221-110		800	15-40	30	1	4	Ow	1/2	G	Water	Yes	Belt	Ow	Willard	75	52	26	Manual	Manual	Throttle	595
222-110		800	15-40	30	1	4	Ow	1/2	G	Water	Yes	Belt	Ow	Willard	75	52	26	Manual	Manual	Throttle	595
223-110		800	15-40	30	1	4	Ow	1/2	G	Water	Yes	Belt	Ow	Willard	75	52	26	Manual	Manual	Throttle	595
224-110		800	15-40	30	1	4	Ow	1/2	G	Water	Yes	Belt	Ow	Willard	75	52	26	Manual	Manual	Throttle	595
225-110		800	15-40	30	1	4	Ow	1/2	G	Water	Yes	Belt	Ow	Willard	75	52	26	Manual	Manual	Throttle	595
226-110		800	15-40	30	1	4	Ow	1/2	G	Water	Yes	Belt	Ow	Willard	75	52	26	Manual	Manual	Throttle	595
227-110		800	15-40	30	1	4	Ow	1/2	G	Water	Yes	Belt	Ow	Willard	75	52	26	Manual	Manual	Throttle	595
228-110		800	15-40	30	1	4	Ow	1/2	G	Water	Yes	Belt	Ow	Willard	75	52	26	Manual	Manual	Throttle	595
229-110		800	15-40	30	1	4	Ow	1/2	G	Water	Yes	Belt	Ow	Willard	75	52	26	Manual	Manual	Throttle	595
230-110		800	15-40	30	1	4	Ow	1/2	G	Water	Yes	Belt	Ow	Willard	75	52	26	Manual	Manual	Throttle	595
231-110		800	15-40	30	1	4	Ow	1/2	G	Water	Yes	Belt	Ow	Willard	75	52	26	Manual	Manual	Throttle	595
232-110		800	15-40	30	1	4	Ow	1/2	G	Water	Yes	Belt	Ow	Willard	75	52	26	Manual	Manual	Throttle	595
233-110		800	15-40	30	1	4	Ow	1/2	G	Water	Yes	Belt	Ow	Willard	75	52	26	Manual	Manual	Throttle	595
234-110		800	15-40	30	1	4	Ow	1/2	G	Water	Yes	Belt	Ow	Willard	75	52	26	Manual	Manual	Throttle	595
235-110		800	15-40	30	1	4	Ow	1/2	G	Water	Yes	Belt	Ow	Willard	75	52	26	Manual	Manual	Throttle	595
236-110		800	15-40	30	1	4	Ow	1/2	G	Water	Yes	Belt	Ow	Willard	75	52	26	Manual	Manual	Throttle	595
237-110		800	15-40	30	1	4	Ow	1/2	G	Water	Yes	Belt	Ow	Willard	75	52	26	Manual	Manual	Throttle	595
238-110		800	15-40	30	1	4	Ow	1/2	G	Water	Yes	Belt	Ow	Willard	75	52	26	Manual	Manual	Throttle	595
239-110		800	15-40	30	1	4	Ow	1/2	G	Water	Yes	Belt	Ow	Willard	75	52	26	Manual	Manual	Throttle	595
240-110		800	15-40	30	1	4	Ow	1/2	G	Water	Yes	Belt	Ow	Willard	75	52	26	Manual	Manual	Throttle	595
241-110		800	15-40	30	1	4	Ow	1/2	G	Water	Yes	Belt	Ow	Willard	75	52	26	Manual	Manual	Throttle	595
242-110		800	15-40	30	1	4	Ow	1/2	G	Water	Yes	Belt	Ow	Willard	75	52	26	Manual	Manual	Throttle	595
243-110		800	15-40	30	1	4	Ow	1/2	G	Water	Yes	Belt	Ow	Willard	75	52	26	Manual	Manual	Throttle	595
244-110		800	15-40	30	1	4	Ow	1/2	G	Water	Yes	Belt	Ow	Willard	75	52	26	Manual	Manual	Throttle	595
245-110		800	15-40	30	1	4	Ow	1/2	G	Water	Yes	Belt	Ow	Willard	75	52	26	Manual	Manual	Throttle	595
246-110		800	15-40	30	1	4	Ow	1/2	G	Water	Yes	Belt	Ow	Willard	75	52	26	Manual	Manual	Throttle	595
247-110		800	15-40	30	1	4	Ow	1/2	G	Water	Yes	Belt	Ow	Willard	75	52	26	Manual	Manual	Throttle	595
248-110		800	15-40	30	1	4	Ow	1/2	G	Water	Yes	Belt	Ow	Willard	75	52	26	Manual	Manual	Throttle	595
249-110		800	15-40	30	1	4	Ow	1/2	G	Water	Yes	Belt	Ow	Willard	75	52	26	Manual	Manual	Throttle	595
250-110		800	15-40	30	1	4	Ow	1/2	G	Water	Yes	Belt	Ow	Willard	75	52	26	Manual	Manual	Throttle	595
251-110		800	15-40	30	1	4	Ow	1/2	G	Water	Yes	Belt	Ow	Willard	75	52	26	Manual	Manual	Throttle	595
252-110		800	15-40	30	1	4	Ow	1/2	G	Water	Yes	Belt	Ow	Willard	75	52	26	Manual	Manual	Throttle	595
253-110		800	15-40	30	1	4	Ow	1/2	G	Water	Yes	Belt	Ow	Willard	75	52	26	Manual	Manual	Throttle	595
254-110		800	15-40	30	1	4	Ow	1/2	G	Water	Yes	Belt	Ow	Willard	75	52	26	Manual	Manual	Throttle	595
255-110		800	15-40	30	1	4	Ow	1/2	G	Water	Yes	Belt	Ow	Willard	75	52	26	Manual	Manual	Throttle	595
256-110		800	15-40	30	1	4	Ow	1/2	G												

Motor Age Farm-Lighting Specification Tables

Name and Model	Maker	Watts Capacity	No. 20 watt lamps	Lamp volts	No. cyl'ds	No. cycles	Make of engine	Horsepower	Fuel	Cooling	Power pulley	Generator drive	Make of generator	Make of battery	Battery amp. hours	Battery volt.	No. cells	Starting engine	Stopping engine	Governor type	Price
Syno. Uni-Electric, 1 KW.	Beaudette & Graham Eng. Co., Boston, Mass.	1000	62-70	32	1	4	Own	3	G	Water	Yes	Direct	Roth	Willard	30-100	32	16	S-Auto.	Throttle	Throttle	563.50
Universal, 1 1/2 KW.	Uni-Electric Corp., Detroit, Mich.	1000	50	110	1	4	Own	3	G	Water	No	Direct	Own	...	60-75	32	16	S-Auto.	Throttle	Throttle	380
1 KW.	Universal Products Co., Sandusky, Ohio	500	17	32	1	4	Own	3	G	Water	No	Direct	Own	...	90-130	32	16	S-Auto.	Throttle	Throttle	495
4 KW.	Western Electric Co., New York	1000	75-100	32	1	4	Own	3 1/2	K	Water	Yes	Direct	Own	...	120-165	32	16	S-Auto.	Throttle	Throttle	530
West. Elect., 15-DC-90.	Electric Auto-Light Corp., Toledo, Ohio	1500	75	32	1	4	Own	2 1/2	K	Air	Yes	Direct	Own	...	130	32	16	S-Auto.	Throttle	Throttle	975
Willys Light.	Winton Engine Works, Cleveland, Ohio	750	85	32	1	4	Own	2	G	Air	Yes	Direct	Own	...	180	32	16	S-Auto.	Throttle	Throttle	525
Winton.	Lauson, Lawton Co., De Pere, Wis.	5000	250	115	1	4	Own	2 1/2	G & K	Water	Yes	Belt	Own	...	225	32	16	S-Auto.	Throttle	Throttle	...
Wisconsin.	...	600	12	32	1	4	Own	3	G & K	Water	Yes	Belt	Own	...	Opt.	32	16	Manual	Throttle	Throttle	...
303.	...	800	24	32	1	4	Own	3	G & K	Water	Yes	Belt	Own	...	Opt.	32	16	Manual	Throttle	Throttle	...
304.	...	2000	40	32	1	4	Own	4	G & K	Water	Yes	Belt	Own	...	Opt.	32	16	Manual	Throttle	Throttle	...

*Without engine. Opt., Optional. S-Auto., Semi-Automatic. K, Kerosene. G, Gasoline. Electro-Mag., Electro-Magnetic. A-L., Auto-Light. West., Westinghouse. R. & M., Robbins & Myers.

LAW IN YOUR BUSINESS

(Continued from page 42)

California the citizens of that state may be thus defrauded, but not so in Texas.

DUTIES OF PURCHASER OF AUTOMOBILE

In another Texas case the purchaser of an automobile brought suit to recover the purchase price from the dealers on allegations of a breach of warranty to the effect that it was a good automobile and would give good service. On trial the jury found that it did not give good service, but they further found that the automobile was a good "serviceable car for the purposes for which plaintiff purchased same." The jury also found that the plaintiff ran the automobile without oil and thereby injured it in its running and service, and judgment was affirmed for the dealers.

In its opinion the court held that "A guaranty that an automobile will give good service implies that it is to be handled and driven as automobiles ordinarily are, and given the care and supplied with oil, gasoline, etc., such as are proper to the use and running of such character of machinery."—(Conner vs. Schnell & Weaver, 210 S. W. 753.)

AUTOMOBILE INSURANCE PAYABLE AFTER 60 DAYS—COMPANY MAY NOT RETURN STOLEN CAR

In an important case on automobile insurance decided by the Supreme Court of Illinois, one O'Connor had his automobile stolen upon which he had a theft insurance policy, whereupon he brought suit to recover the value of the automobile as fixed by the policy. It appears that O'Connor about five days after the theft bought a new car, giving his note therefor, and assigning the policy in question to the sellers of the new car, as collateral security for the note. Sixty-five days after the theft, the stolen car was recovered, but O'Connor refused to take it back on the ground he was entitled to the insurance money.

PROVISIONS OF THE POLICY IN SUIT

The policy provided, among many things, that it would be optional with the insurance company to repair, rebuild or replace the property lost or destroyed, but that there could be no abandonment to the company of the property described in the policy. It further provided that notice in writing must be given by the insured of the loss, and finally that the policy should be payable sixty days after notice and satisfactory proof of loss was received by the insurance company.

HOLDINGS OF THE COURT

On affirming the judgment against the insurance company, the court held that under the policy, making loss payable 60 days after notice and proof of loss, and providing that there could be no abandonment to the company, where the automobile insured was recovered after 60 days, the insurer was nevertheless, liable for its full value, without

reference to abandonment, which means the relinquishment of a right.

Regarding the notice of loss required by the policy the court said an informal notice in writing to the insurance company's agent was sufficient, when considered so by the agent, although not accompanied by sworn statement, as required by the policy; the insured having the right to rely on the agent's assurance that the proof was sufficient.

N. J. LIEN LAW MOST FAVORABLE TO GARAGE KEEPER

The garage keeper in New Jersey has been afforded protection by lien laws, enacted by the state legislature, more favorable perhaps than those of any other state. The legality of the acts were recently upheld in the case of Frank vs. Dailey (165 Atl. 9). The facts involved were that Frank bought an automobile from one Waldron, who had previously purchased it from La Rue, that the latter while owner obtained from defendant certain supplies for his car, that the defendant garage keeper never had possession of the car until it was seized by one of his agents. Now Frank bought the car in good faith and without notice of defendant's claim to a lien for supplies furnished the car. The garageman seized the car. Frank refused to pay the lien claim and replevined the car.

ISSUES IN THE SUIT

In the trial Frank contended the lien statute was unconstitutional, and secondly, that if the defendant had acquired a lien it was cut off by the sale first to Waldron and subsequently to himself, a bona fide purchaser and without notice. Judgment in the trial court was given Frank awarding him possession of the automobile and damages with costs for its detention by the garage keeper.

LIEN VALID WITHOUT POSSESSION AT ANY TIME

The Supreme Court of New Jersey reversed this judgment and awarded possession of the car to the garage keeper. In its opinion this court held that under the N. J. statute giving garage keepers a lien on an automobile for which supplies are furnished, a garage keeper has a lien on an automobile for which he furnishes supplies, although the automobile was never in his possession.

Further, the court held that the garage keeper who furnished supplies for an automobile, may seize the car and enforce its lien under the statute; although the automobile is in the possession of and has been sold to an innocent purchaser for value who had no notice of garage keeper's claim.

NEWARK GETS S. G. V. PLANT

Newark, N. J., April 20—Newark has been chosen as the site of the new factory of the S. G. V. Motor Car Co. Levett A. Grant, who is to head the reorganized S. G. V. company made the selection after a careful survey of conditions here.

From the Four Winds

Glimpses at the World of Motordom

Coming Motor Events

AUTOMOBILE SHOWS

Kingston, Ont.	First Annual Show	April 27 to May 1
Annheim, Cal.	First Annual Show Orange County Automobile Trade Ass'n.	May 5-8
Macon, Ga.	Macon Automobile Dealers' Ass'n.	May 6 to 8
Northampton, Mass.	Annual Automobile H. F. & H. Agricultural Society, Three County Fair Grounds, A. J. Morse, Secretary	Oct. 6-8

FOREIGN SHOWS

Kingston, Ont.	First Annual Show, Kingston Automobile Dealers' Ass'n, Armories, Q. C. Kirby, Mgr.	April 27-May 1
Antwerp	Cars, tires, wheels, parts and equipment	May 15-June 13
Antwerp	Commercial vehicles, tractors, trucks and engines	June 26-July 25
Antwerp	Motorcycles, side cars, parts and equipment	Aug. 7-Sept. 15
London, Eng.	Commercial Vehicles Exhibition, Olympia	October
London	Passenger Car Show, Olympia	November

RACES

Indianapolis Speedway	500-Mile Race	May 31
Uniontown, Pa.	Speedway Race	June 12
Tacoma, Wash.	Speedway Race	July 5
Paris, France	Grand Prix Race, Sporting Commission	August
Cincinnati, O.	Speedway Race	Sept. 6
Uniontown, Pa.	Speedway Race	Sept. 6

TOURS

Omaha, Neb.	Truck Reliability Run	June 1
Milwaukee, Wis.	Wisconsin Truck Tour, Milwaukee Sentinel	June 21-26
Lake Huron Tour		July 4
New York-San Francisco	Glidden Tour	September

Texas Shows Big Increase—During the first three months of the present year there were 316,843 motor vehicles registered in Texas, according to figures just compiled by the State Highway Department. It is expected that during the remaining nine months of 1920 fully 100,000 additional registrations will be made, making a total of approximately 416,000, as compared with 321,800 motor vehicles registered last year.

The same ratio of increase is apparent in various licenses issued by the department; the total dealers' licenses issued in 1919 were 3283, while for the quarter ending March 31, there have been 2284 registered; 70,227 transfers were issued in 1919, and 38,625 this year, while for 1919, 25,646 chauffeurs' licenses were issued and for the three months of the present year, 11,866 have been issued. The number of duplicate seals issued in 1919 were 9760, and so far this year, 1637 have been issued.

Motor Car Deaths Decrease—Announcement is made by the commissioner of motor vehicles that according to statistics the rate of death per 10,000 automobile registration shows a steady decrease. The highest number shown since cars began to be used in Connecticut was in 1916, in which year there were 31 deaths caused by motor vehicles for every 10,000 cars registered. Since that time the decrease has been steady and in 1919 there were but 20 deaths for each 10,000 cars registered.

Ohio Has Road Patrol System—The new patrol system for the roads of

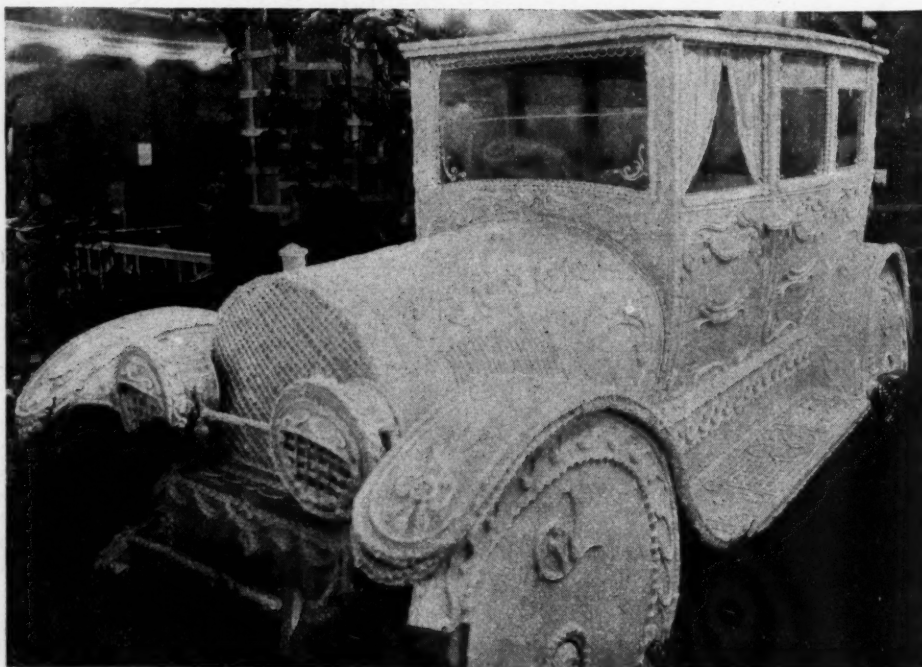
Franklin county (Ohio) was inaugurated early in April under the charge of C. C. Lattimer, county surveyor. The county

has been divided into 10 patrol districts, each in charge of a foreman, who will have from four to eight men to look after the repair work. Each district will have a patrol headquarters, centrally located where supplies of all kinds will be kept. In addition there will be two county supply stations for the general storage of supplies. There will be five complete maintenance crews, equipped with all of the necessary machinery. It is estimated that the cost will be \$150,000 yearly.

Saskatchewan Has Most Cars—According to population the province of Saskatchewan has the greatest number of motor vehicles in Canada. The following list shows the number of persons to each car in the nine provinces, compiled from the latest statistics recorded:

Saskatchewan, per capita	13.4
Alberta, per capita	17.1
Manitoba, per capita	18.2
Ontario, per capita	20.2
British Columbia, per capita	37.5
New Brunswick, per capita	45.2
Nova Scotia, per capita	52.5
Quebec, per capita	66.5
P. E. Island, per capita	82.8

Made of Sugar



The "C. W. R. C. 12-cylinder" made of sugar by George Kosak, head pastry artist of the Chauncey Wright Restaurants Co. This masterpiece of the bakers art was exhibited at the recent Seattle automobile show and attracted much attention